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(54) BIODEGRADABLE FLAME-RETARDANT COMPOSITE COMPOSITION AND METHOD FOR PRODUCING THE SAME

(57)Abstract:

PROBLEM TO BE SOLVED: To provide a composition which can be disposed of without influencing the natural environment so much and has biodegradability, flame retardancy, and mechanical strengths.

SOLUTION: The composition contains one or a plurality of biodegradable organic polymers, a flame-retardant additives, and a hydrolysis inhibitor for the organic polymer or polymers.

CLAIMS

[Claim(s)]

[Claim 1]A constituent containing hydrolysis inhibitor of an organic polymer compound characterized by comprising the following.

An organic polymer compound which has 1 or two or more sorts of biodegradability.

A fire-resistant system additive agent.

Said biodegradability.

[Claim 2]The constituent according to claim 1, wherein an organic polymer compound which has biodegradability is polysaccharide, aliphatic polyester, polyamino acid, polyvinyl alcohol, polyalkylene glycol, or a copolymer containing any at least one of said the compounds.

[Claim 3]Aliphatic polyester Polylactic acid, a polycaprolactone, poly hydroxy butanoic acid, The constituent according to claim 1 being a polyhydroxy valeric acid, polyethylene succinate, polybutylene succinate, a polybutylene horse mackerel peat, polymalic acid, microorganism synthetic polyester, or a copolymer containing any at least one of said the compounds.

[Claim 4]The constituent according to claim 1, wherein fire-resistant system additive agents are at least one sort of compounds chosen from a hydroxide system compound, the Lynn system compound, and a silica system compound.

[Claim 5]The constituent according to claim 4, wherein a fire-resistant system additive agent is a hydroxide system compound of not less than 99.5% of purity.

[Claim 6]The constituent according to claim 4, wherein a fire-resistant system additive agent is a hydroxide system compound of particle state below 5.0 m of BET specific surface area ²/g.

[Claim 7]The constituent according to claim 4, wherein a fire-resistant system additive agent is a hydroxide system compound of particle state with a mean particle diameter of 100 micrometers or less.

[Claim 8]The constituent according to claim 4 in which a fire-resistant system additive agent is characterized by content of a silica dioxide being not less than 50% of silica system compound.

[Claim 9]The constituent according to claim 4, wherein a fire-resistant system additive agent is a silica system compound of particle state with a mean particle diameter of 50 micrometers or less.

[Claim 10]The constituent according to claim 1, wherein hydrolysis inhibitor is at least one sort of compounds chosen from a carbodiimide compound, an isocyanate compound, and an oxo ZORIN compound.

[Claim 11]A manufacturing method of the constituent according to claim 1 compounding hydrolysis inhibitor of an organic polymer compound characterized by comprising the following.

An organic polymer compound which has 1 or two or more sorts of biodegradability.

A fire-resistant system additive.

Said biodegradability.

[Claim 12]Mold goods which consist of the constituent according to claim 1.

[Claim 13]The mold goods according to claim 12 being the cases of an electric product.

[Claim 14]An electric product which makes a component parts which consist of the constituent according to claim 1.

[Translation done.]

DETAILED DESCRIPTION

[Detailed Description of the Invention]

[0001]

[Field of the Invention] This invention relates to the constituent which can reduce the adverse effect to environment by carrying out biodegradation, when fire retardancy is given and it is discarded by natural environment.

[0002]

[Description of the Prior Art] Various kinds of synthetic resin materials are developed and provided, the amount used in various fields of industry increases every year in recent years, and about 10 million t per year of a variety of synthetic resins came to be produced. As the result, the quantity of synthetic resin waste also increases and the processing serves as a big social problem. Harmful gas may be emitted, or carrying out incineration processing of the discarded resin as it is may cause damage to an incinerator with big combustion heat, and it is to give big load to environment.

[0003] There is a method from which it has reclaimed land enough and which incinerates what carried out depolymerize of the abandonment resin, for example by a pyrolysis or chemical decomposition as a disposal method of the abandonment resin known conventionally, or is carried out. However, in order to accompany incineration processing by emission of carbon dioxide, there is a possibility of causing global warming. When sulfur, nitrogen, or halogen contains in incineration resin, it becomes a cause of the air pollution by a toxic exhaust gas to carry out incineration processing. On the other hand, when reclaiming land from resin, since almost all the resin used remains in the state as it is, without being decomposed for a long period of time, it causes soil pollution now. Then, biodegradable resin is being developed and put in practical use to such a problem in recent years. Since it is biochemically decomposed into carbon dioxide, water, etc. by the microorganism etc., when discarded to natural environment, it decomposes easily, and low molecule quantification is carried out and biodegradable resin changes to a harmless compound to environment. Therefore, the adverse effect to the earth environment accompanying abandonment can be reduced by using biodegradable resin. Since it is such, its attention is paid to biodegradable resin and utilization is advanced to the disposable products mainly concerned with daily-use products, sanitary goods, or a play article until now.

[0004] As mentioned above, about fire retardancy with the demand increasing as one of the safeties at the time of resin actually being used for conventional biodegradable resin, although the safety to natural environment is secured, existing biodegradable resin is not enough. Although there is a request of liking to form a case etc. with biodegradable resin and to make processing after recovery easy especially about an electric product, in order to use it as a case

of an electric product, It is necessary to fulfill the fire-resistant standard provided in Japanese Industrial Standard (JIS) or UL (Under-writer Laboratory) standard, and cannot respond to said fire-resistant standard in existing biodegradable resin. When applying biodegradable resin to daily necessities, such as cases, such as an electric product and electronic equipment, a conservation characteristic (endurance in homoiothermal constant humidity conditions) is required with the above-mentioned fire retardancy. For example, in small audio goods, it is required to maintain physical properties, such as intensity, three to seven years on 30 ** and the conditions of 80% of relative humidity.

[0005]Various examination is performed in order to give conventionally the physical properties which were suitable for practical mold goods to biodegradable resin. For example, aliphatic polyester resin which is an example of representation of biodegradable polymer is received, Improvement in the crystallization rate by addition of an inorganic filler and addition of a nucleus agent and a glass transition point about the molded product using such plastics, such as a blend with the biodegradable resin in which low rubber character is shown, Some patent application is already made (JP,3-290461,A, JP,4-146952,A, JP,4-325526,A, etc.). However, especially these molded products are used as a film or wrapping.

About physical properties, such as fire retardancy or a mechanical strength, it is not enough.

[0006]

[Problem(s) to be Solved by the Invention]Then, this invention has few adverse effects to the natural environment at the time of abandonment, and an object of this invention is to provide the constituent which has biodegradability, fire retardancy, and a mechanical strength.

[0007]

[Means for Solving the Problem]This invention persons did the knowledge of the above-mentioned technical problem being solvable to biodegradable resin by adding a fire-resistant system additive agent and hydrolysis inhibitor of biodegradable resin. Although a flameproofing agent of a halogen system is mentioned as a fire-resistant system additive agent, since halogen gas is emitted at the time of incineration processing of this resin and complicated processing is needed for making this halogen gas harmless to a human body when a flameproofing agent of a halogen system is included in resin, it cannot be said as a suitable example.

[0008]Then, artificers paid their attention to ** hydroxide system compound, ** ammonium phosphate system compound, and ** silica system compound as a fire-resistant system additive agent in which environment was considered. ** A hydroxide system compound produces water at the same time such materials carry out the endothermic of the heat generated when resin burns and it decomposes, and it reveals fire retardancy by an endothermic action and generating of water. ** Decompose at the time of combustion, and an

ammonium phosphate system compound generates polymetaphosphate, and demonstrates a fire-resistant effect by oxygen interception by formation of carbon coating generated newly as a result of the dehydrating action. ** A silica system compound gives fire retardancy to resin by an effect of an inorganic filler to resin. Flameproofing of resin is realized by combining biodegradable resin and a fire-resistant system additive agent of the above-mentioned ** - **.

[0009]By adding hydrolysis inhibitor of biodegradable resin to this compound resin further, as a result of this invention persons' considering improvement containing biodegradable resin and a fire-resistant system additive agent of the above-mentioned ** - ** in a mechanical strength of said compound resin, A hydrolysis rate of biodegradable resin in said compound resin was delayed, and knowledge that a mechanical strength of said compound resin was held rather than former for a long period of time at the reason was acquired. As mentioned above, this invention persons came to invent ideal resin which it was using a ternary system of biodegradable resin, a fire-resistant system additive agent, and hydrolysis inhibitor, was new, and has biodegradability, fire retardancy, and a mechanical strength.

[0010]That is, this invention is (1). An organic polymer compound which has 1 or two or more sorts of biodegradability, A constituent containing a fire-resistant system additive agent and hydrolysis inhibitor of an organic polymer compound which has said biodegradability, An organic polymer compound which it has biodegradability (2) Polysaccharide, aliphatic polyester, Polyamino acid, polyvinyl alcohol, or polyalkylene glycol, Or a constituent of the aforementioned (1) statement being a copolymer containing any at least one of said the compounds, Aliphatic polyester (3) Polylactic acid, a polycaprolactone, poly hydroxy butanoic acid, A polyhydroxy valeric acid, polyethylene succinate, polybutylene succinate, It is related without a constituent of the aforementioned (1) statement being a polybutylene horse mackerel peat, polymalic acid, microorganism synthetic polyester, or a copolymer containing any at least one of said the compounds.

[0011]This invention is (4). A constituent of the aforementioned (1) statement, wherein fire-resistant system additive agents are at least one sort of compounds chosen from a hydroxide system compound, the Lynn system compound, and a silica system compound, (5) A constituent of the aforementioned (4) statement, wherein a fire-resistant system additive agent is a hydroxide system compound of not less than 99.5% of purity, (6) A constituent of the aforementioned (4) statement, wherein a fire-resistant system additive agent is a hydroxide system compound of particle state below 5.0 m of BET specific surface area $^2/g$, (7) A constituent of the aforementioned (4) statement, wherein a fire-resistant system additive agent is a hydroxide system compound of particle state with a mean particle diameter of 100 micrometers or less, (8) A constituent of the aforementioned (4) statement in which a fire-resistant system additive agent is characterized by content of a silica dioxide being not less than 50% of silica system compound, and (9) A fire-resistant system additive agent is related

without a constituent of the aforementioned (4) statement being a silica system compound of particle state with a mean particle diameter of 50 micrometers or less.

[0012]This invention is (10). Hydrolysis inhibitor Carbodiimide compound, A constituent of the aforementioned (1) statement being at least one sort of compounds chosen from an isocyanate compound and an oxo ZORIN compound, and (11) An organic polymer compound which has 1 or two or more sorts of biodegradability, A manufacturing method of a constituent of the aforementioned (1) statement compounding a fire-resistant system additive and hydrolysis inhibitor of an organic polymer compound which has said biodegradability, (12) Mold goods and (13) which consist of a constituent of the aforementioned (1) statement Mold goods given in the above (12) being a case of an electric product, and (14) It is related without an electric product which makes a component parts which become the above (1) from a constituent of a statement.

[0013]

[Embodiment of the Invention]Next, about the constituent of this invention, the constituent and manufacturing method are described below. As an organic polymer compound (henceforth a "biodegradable polymer compound") which has the biodegradability used by this invention, If a microorganism involves in a nature and after use are a low molecular weight compound and a compound (Biodegradable Plastics Society, ISO/TC-207/SC3) eventually disassembled into water and carbon dioxide, there will be no restriction in particular. As a biodegradable polymer compound, biodegradable resin is preferred. The polysaccharide which specifically has biodegradability as biodegradable resin, The copolymer of either peptide, aliphatic polyester, polyamino acid, polyvinyl alcohol, polyamide or polyalkylene glycol and said compound etc. which contain one of one at least are mentioned. Especially, since aliphatic polyester is excellent in mixing nature or mass production nature, it is preferred as a biodegradable polymer compound used by this invention. As said aliphatic polyester, polylactic acid, such as a random copolymer of Polly L-lactic acid (PLLA), L-lactic acid, and D-lactic acid, or those derivatives are more preferred. For example, the polycaprolactone classified into other polyester, of course, Poly hydroxy butanoic acid, a polyhydroxy valeric acid, polyethylene succinate, Polybutylene succinate, polybutylene horse mackerel peat, polymalic acid, polyglycolic acid, polysuccinate, polyoxalic-acid-ester, and butylene polydiglycolate and polydioxanone, it is usable in microorganism synthetic polyester etc. Here, as microorganism synthetic polyester, 3-hydroxy butyrate (3HB), 3-hydroxy BARIRETO (3HV), or its copolymer is mentioned.

[0014]As the above-mentioned polysaccharide, either cellulose, starch, chitosan, dextran or these derivatives and the copolymer containing these one can be mentioned. Collagen, casein, fibrin, gelatin, etc. are mentioned as the above-mentioned peptide. As the above-mentioned polyamide, the nylon 4, nylon 2 / nylon 6 copolymer, etc. are mentioned, for example.

[0015]Although there is biodegradability in low molecular weight, if biodegradability comes to be acquired by graft copolymerization with the biodegradable polymer compound illustrated above, etc. even if it is a biodegradable low organic polymer compound, in this invention, this can be used in the amount of polymers. Specifically in such an amount of polymers, polyethylene, a polyacrylic acid derivative, polypropylene, polyurethane, etc. are mentioned as a biodegradable low organic polymer compound, for example. About the molecular weight and end group of these resin, if mechanical intensity is obtained, there will be no restriction in particular.

[0016]The biodegradable polymer compound used by this invention can be manufactured in accordance with a publicly known method. For example, biodegradable polyester can be manufactured by methods, such as the ** lactide method, a polycondensation of ** polyhydric alcohol and polybasic acid, or an intermolecular polycondensation of the hydroxycarboxylic acid which has a hydroxyl group and a carboxyl group in ** intramolecular.

[0017]In the fire-resistant system additive in this invention, there is no restriction in particular in the compound which can be used. As said fire-resistant system additive, various kinds of boric acid system fire retardancy compounds, the Lynn system fire retardancy compound, an inorganic system fire retardancy compound, the Chisso system fire retardancy compound, a halogen system fire retardancy compound, an organic system fire retardancy compound, a colloidal system fire retardancy compound, etc. are mentioned, for example. the fire-resistant system additive shown below -- a kind -- or two or more sorts may be used.

[0018]As a boric acid system fire retardancy compound, the compound containing boric acid, such as a zinc borate hydrate, barium metaboric acid, and way sand, etc. are mentioned, for example. As a Lynn system fire retardancy compound, for example Ammonium phosphate, ammonium polyphosphate, Melamine phosphate, red phosphorus, phosphoric ester, tris (chloroethyl) phosphate, Tris (monochloro propyl) phosphate, tris (dichloropropyl) phosphate, Triaryl phosphate, tris (3-hydroxypropyl) phosphate, Tris (tribromophenyl) phosphate, tris-beta-chloropropyl phosphate, Tris (dibromophenyl) phosphate, tris (tribromo neopentyl) phosphate, Tetrakis (2-chloroethyl) ethylene diphosphate, dimethylmethyl phosphate, Tris(2-chloroethyl) orthophosphoric acid ester, aromatic condensed-phosphoric-acid ester, Halogen-containing condensation organophosphate, ethylene screw tris (2-cyanoethyl) phosphonium bromide, Ammonium polyphosphate, beta-chloroethyl ASSHIDO phosphate, butyl pyrophosphate, butyl ASSHIDO phosphate, butoxyethyl ASSHIDO phosphate, 2-ethylhexyl ASSHIDO phosphate, a melamine phosphate, halogen-containing phosphonate, Or the compound containing Lynn, such as phenylphosphonic acid, is mentioned.

[0019]As an inorganic system fire retardancy compound, for example Sulfate of zinc, potassium bisulfate, Aluminum sulfate, antimony sulfate, sulfate ester, potassium sulfate, Cobalt sulfate, sodium hydrogensulfate, ferrous sulfate, copper sulfate, sodium sulfate, Sulfuric

acid metallic compounds, such as nickel sulfate, barium sulfate, and magnesium sulfate, Iron oxide system combustion catalysts, such as the Amon system fire retardancy compounds, such as ammonium sulfate, and ferrocene, The compound containing titanium, such as nitric acid metallic compounds, such as a cupric nitrate, and titanium oxide, Gold hydroxide groups and those denaturation things, such as carbonate compounds, such as guanidinium system compounds, such as guanidine sulfamate, other zirconium system compounds, a molybdenum system compound, a tin system compound, and potassium carbonate, aluminium hydroxide, or magnesium hydroxide, are mentioned.

[0020]As a Chisso system fire retardancy compound, the cyanurate compound etc. which have a triazine ring are mentioned, for example. As a halogen system fire retardancy compound, for example A chlorinated paraffin, par chlorocyclopentadecane, Hexabromobenzene, decabromo diphenyloxide, bis(tribromophenoxy)ethane, Ethylene screw dibromo norbornane dicarboxyimide, an ethylene screw tetrabromo phthalimide, Dibromoethyldibromocyclohexane, dibromo neopentyl glycol, 2,4,6-tribromophenol, tribromophenyl allyl ether, A tetrabromo bisphenol A derivative, a tetrabromo bisphenol S derivative, Tetradecabromodiphenoxybenzene, tris-(2, 3-dibromopropyl)-isocyanurate, 2,2-bis(4-hydroxy-3,5-dibromophenyl)propane, 2,2-bis(4-hydroxyethoxy-3,5-dibromophenyl)propane, Poly (pentabromobenzyl acrylate), tribromostyrene, Tribromophenyl MAREINIDO, tribromo neopentyl alcohol, tetrabromo dipentaerythritol, pentabromobenzyl acrylate, pentabromophenol, pentabromotoluene, pentabromo diphenyloxide, A hexabromocyclododecane, hexabromodiphenyl ether, octabromo phenol ether, Octadibromodiphenyl ether, octabromo diphenyloxide, The fire-resistant compound containing halogen, such as magnesiumhydroxide, dibromo neopentyl glycol tetracarbonate, bis (tribromophenyl)fumaramide, N-methylhexabromodiphenylamine, styrene bromide, or diallyl chlorendate, is mentioned.

[0021]As an organic system fire retardancy compound, for example Chlorendic anhydride, phthalic anhydride, Glycidyl compounds, such as a compound containing bisphenol A, and glycidyl ether, Silica system compounds, such as polyhydric alcohol, such as a diethylene glycol and pentaerythritol, denaturation carbamide, silicone oil or a silica dioxide, low melting glass, and the ORGANO siloxane, are mentioned. The aluminium hydroxide which has the fire retardancy currently used from the former as a colloidal system fire retardancy compound, for example, Hydroxide, such as magnesium hydroxide and calcium hydroxide, an ulmin calcium oxide, Colloid of fire-resistant compounds, such as nitric acid compounds, such as hydrates, such as 2 hydration gypsum fibrosum, zinc borate, barium metaboric acid, a borax, and kaolin clay, and sodium nitrate, a molybdenum compound, a zirconium compound, an antimony compound, a dawsonite, or pro GOPAITO, etc. are mentioned.

[0022]As for the fire-resistant system additive in this invention, what does not give load

especially to environment in the case of abandonment -- poisonous gas is emitted, for example in the case of incineration disposal -- is preferred. From a viewpoint of such an environmental consideration, as a fire-resistant system additive in this invention, ** For example, hydroxide system compounds, such as aluminium hydroxide, magnesium hydroxide, or calcium hydroxide, ** It is desirable to use silica system compounds, such as ammonium phosphate system compounds, such as the Lynn system compound which was mentioned above especially ammonium phosphate, or ammonium polyphosphate, **, for example, a silica dioxide, low melting glass, or the ORGANO siloxane.

[0023]As a silica system compound suitable as a fire-resistant system additive used by said this invention, the silica system compound whose content of a silica dioxide is not less than about 50% is more preferred. Since a silica system compound is extracted from the mineral of natural origin, this is a certain amount of [substances (for example, MgO , CaO , Fe_2O_3 , $\text{aluminum}_2\text{O}_3$, etc.) other than a silica system compound] reason to be contained. However, as for the effect as an inorganic system filler for fire retardancy, not being prevented with an impurity is preferred.

[0024]As a hydroxide system compound suitable as a fire-resistant system additive used by said this invention, that in which the purity is not less than about 99.5% is more preferred. It is because preservation stability when a hydrolysis controlling agent is combined improves, so that the purity of a hydroxide system compound is high. The purity of a hydroxide system compound can be measured by a publicly known method. For example, if the content of the impurity contained in the hydroxide system compound is measured by a publicly known method and the content of said impurity is subtracted from entire volume, the purity of a hydroxide system compound can be obtained. More specifically, in the case of aluminium hydroxide, Fe_2O_3 , SiO_2 , $\text{T-Na}_2\text{O}$, $\text{S-Na}_2\text{O}$, etc. are mentioned as an impurity, for example. The content of Fe_2O_3 is calculated by O-phenanthroline absorption photometry (JIS H 1901) after dissolving in sodium carbonate boric acid liquid. The content of SiO_2 is calculated by molybdenum blue absorption photometry (JIS H 1901) after dissolving in sodium carbonate boric acid liquid. The content of $\text{T-Na}_2\text{O}$ is frame photometry after dissolving in sulfuric acid, and $\text{S-Na}_2\text{O}$ is called for with frame photometry after warm water extraction. The purity of hydroxide can be obtained by reducing the content calculated by the above from the weight of aluminium hydroxide. If there is not less than 99.5% of purity, of course, it can use combining two or more sorts of different fire-resistant system hydroxide system compounds.

[0025]A granular thing is preferred although the shape in particular of the fire-resistant system additive used by this invention is not limited. The particle diameter can be suitably chosen according to the kind of fire-resistant system additive. For example, it is preferred that the

mean particle diameter which is asked for a fire-resistant system additive by laser diffractometry in the case of silica system compounds, such as SiO_2 and glass, is about 50 micrometers or less. Particle size distribution is not asked in this case. It is preferred that the mean particle diameter which is asked for a fire-resistant system additive by laser diffractometry in the case of hydroxide system compounds, such as aluminum(OH)₃, Mg(OH)₂, and Ca(OH)₂, is about 100 micrometers or less. Particle size distribution is not asked in this case. The viewpoint of the injection-molding nature in a molding process or the dispersibility at the time of kneading to mean particle diameter has a preferred mentioned range, and its smaller one also in a mentioned range is more preferred. In order to, raise the filling factor to a constituent, of course, it can use combining two or more sorts of fire-resistant system additive agents in which mean particle diameter differs.

[0026]It is preferred that the BET specific surface area which is asked for a fire-resistant system additive by a nitrogen gas adsorption process in the case of hydroxide system compounds, such as aluminum(OH)₃, Mg(OH)₂, and Ca(OH)₂, uses the particles below

about $5.0\text{-m}^2/\text{g}$. In order to, raise the filling factor to a constituent, of course, it can use combining two or more sorts of fire-resistant system hydroxylation compounds in which BET specific surface areas differ. The viewpoint of a moldability to a BET specific surface area has a preferred mentioned range, and its smaller one also in a mentioned range is more preferred.

[0027]The addition of the fire-resistant system additive in this invention can be arbitrarily set in the range which can secure the mechanical intensity of the constituent concerning this invention. In the case of hydroxide system compounds, such as aluminum(OH)₃, Mg(OH)₂, and Ca(OH)₂, as a concrete addition, a fire-resistant system additive is about about 10 to 40 % of the weight still more preferably about about 7.5 to 45% of the weight preferably about about 5 to 50% of the weight. In the case of ammonium phosphate (poly) system compounds, such as ${}_3(\text{NH}_4)(\text{P}_n\text{O}_{3n+1})^{(n+2)}$ (n is a natural number), a fire-resistant system additive is about about 3 to 15 % of the weight still more preferably about about 2 to 20% of the weight preferably about about 1 to 25% of the weight. In the case of silica system compounds, such as SiO_2 and glass, a fire-resistant system additive is about about 15 to 30 % of the weight still more preferably about about 10 to 35% of the weight preferably about about 5 to 40% of the weight.

[0028]The hydrolysis inhibitor used by this invention is not limited especially as an additive agent which controls hydrolysis of a biodegradable polymer compound. For example, as said hydrolysis inhibitor, the active hydrogen in a biodegradable polymer compound and the compound which has reactivity are mentioned. It can prevent the amount of active hydrogen in

a biodegradable polymer compound decreasing, and active hydrogen hydrolyzing a biodegradable polymer chain catalytically by adding said compound. Here, active hydrogen is hydrogen in the combination (N-H combination and O-H combination) with oxygen, nitrogen, etc. and hydrogen, and this hydrogen has high reactivity compared with hydrogen in combination (C-H combination) of carbon and hydrogen. More specifically, hydrogen in carboxyl group:-COOH [in a biodegradable polymer compound / for example,], hydroxyl group:-OH, amino group:-NH₂, or amide bond:-NHCO- etc. is mentioned.

[0029]As the active hydrogen in said biodegradable polymer compound, and a compound which has reactivity, a carbodiimide compound, an isocyanate compound, and an oxo ZORIN system compound are applicable. Since the melt kneading especially of the carbodiimide compound can be carried out with a biodegradable polymer compound and it can control hydrolysis nature more by a little addition, it is desirable. In a molecule, said carbodiimide compound is a compound which has a carbodiimide group more than a piece, and also contains a poly carbodiimide compound. As a manufacturing method of said carbodiimide compound, As a catalyst, for example For example, O,O-dimethyl- O-(3-methyl-4-nitrophenyl) phosphorothioate, O,O-dimethyl- O-(3-methyl-4-(methylthio) phenyl) phosphorothioate, Organic phosphorus system compounds, such as O,O-diethyl- O-2-isopropyl-6-methylpyrimidine 4-yl phosphorothioate, Or various polymer isocyanates, for example using organic metallic compounds, such as rhodium complexes, a titanium complex, a tungsten complex, and palladium complex Hitoshi, at the temperature of not less than about 70 **. The method of manufacturing according to a decarboxylation polycondensation in a non-solvent or inert solvents (for example, hexane, benzene, dioxane, chloroform, etc.) can be mentioned.

[0030]As a mono- carbodiimide compound contained in this carbodiimide compound, Dicyclohexylcarbodiimide, a diisopropylcarbodiimide, A dimethylcarbodiimide, a diisobutylcarbodiimide, a dioctylcarbodiimide, A diphenylcarbodiimide, a naphthyl carbodiimide, etc. can be illustrated and dicyclohexylcarbodiimide with easy acquisition and a diisopropylcarbodiimide are especially industrially preferred also in these.

[0031]As an isocyanate compound which are active hydrogen in the above-mentioned biodegradable polymer compound, and a compound which has reactivity, For example, 2, 4-tolylene diisocyanate, 2, 6-tolylene diisocyanate, m-phenylene diisocyanate, p-phenylene diisocyanate, - diphenylmethane diisocyanate, and 4 and 4 '2, 4'-diphenylmethane diisocyanate, 2,2'-diphenylmethane diisocyanate, the 3,3'-dimethyl- 4, 4'-biphenylene diisocyanate, The 3,3'-dimethoxy- 4, 4'-biphenylene di-isocyanate, The 3,3'-dichloro- 4, 4'-biphenylene di-isocyanate, 1,5-naphthalene diisocyanate, 1,5-tetrahydronaphthalene diisocyanate, tetramethylene di-isocyanate, 1,6-hexamethylene diisocyanate, dodeca methylene di-isocyanate, Trimethyl hexamethylene di-isocyanate, 1, 3-cyclohexylene diisocyanate, 1,4-cyclohexylenediisocyanate, xylylene diisocyanate, tetramethyl xylylene

diisocyanate, hydrogenation xylylene diisocyanate, lysine diisocyanate, Isophorone diisocyanate, 4,4'-dicyclohexylmethane diisocyanate or the 3,3'-dimethyl- 4, 4'-dicyclohexylmethane diisocyanate, etc. are mentioned.

[0032]The above-mentioned isocyanate compound can be easily manufactured by a publicly known method, and a commercial item can be suitably used for it. As a commercial polyisocyanate compound, aromatic isocyanate adduct objects, such as coronate (the product made from Japanese polyurethane; hydro-diphenylmethane diisocyanate) or milli ONETO (product made from Japanese polyurethane), are applicable. Especially, when manufacturing the constituent concerning this invention by melt kneading, use of a liquefied twist solid, for example, the polyisocyanate compound which blocked the isocyanate group by mask agents (polyhydric aliphatic alcohol, aromatic polyol, etc.), is preferred.

[0033]As an oxazoline system compound which are active hydrogen in the above-mentioned biodegradable polymer compound, and a compound which has reactivity, For example, a 2,2'-o-phenylenescrew (2-oxazoline), a 2,2'-m-phenylenescrew (2-oxazoline), A 2,2'-p-phenylenescrew (2-oxazoline), a 2,2'-p-phenylenescrew (4-methyl-2-oxazoline), A 2,2'-m-phenylenescrew (4-methyl-2-oxazoline), A 2,2'-p-phenylenescrew (4,4'-dimethyl- 2-oxazoline), A 2,2'-m-phenylenescrew (4,4'-dimethyl- 2-oxazoline), 2,2'-ethylene screw (2-oxazoline), 2, and 2'-tetramethylene bis (2-oxazoline), 2,2'-hexa methylenebis (2-oxazoline), 2,2'-octa methylenebis (2-oxazoline), a 2,2'-ethylene screw (4-methyl-2-oxazoline), or a 2,2'-diphenylenescrew (2-oxazoline) is mentioned.

[0034]What is necessary is just to determine the kind and loadings of hydrolysis inhibitor which are blended with the kind or addition of the hydrolysis inhibitor used by this invention according to the product made into the purpose since a biodegradation rate and by extension, the mechanical strength of the constituent concerning this invention can be adjusted. As for the addition of hydrolysis inhibitor, specifically, it is preferred that it is about 5 or less % of the weight. The above-mentioned compound may be alone used for said hydrolysis inhibitor, and even if two or more sorts are used together and used for it, it is not cared about.

[0035]The manufacturing method in particular of the constituent concerning this invention is not limited, but may use a publicly known method. The method of manufacturing by carrying out melt kneading of the fire-resistant system additive agent and hydrolysis inhibitor which were mentioned above to the organic polymer compound which has biodegradability as said manufacturing method is mentioned as a suitable example. When fusing before fusing the organic polymer compound which has biodegradability as a manufacturing method by said melt kneading or, a fire-resistant system additive agent and hydrolysis inhibitor are added, and it is carried out by mixing. At this time, it may add simultaneously and a fire-resistant system additive agent and hydrolysis inhibitor may be added individually. When adding individually, any may be added first. After adding either a fire-resistant system additive agent or hydrolysis

inhibitor after melting and mixing the organic polymer compound which has biodegradability, the obtained constituent is fused again and the method of adding the ingredient of the either remainder of hydrolysis inhibitor or a fire-resistant system additive agent, and mixing is also mentioned.

[0036]Unless the purpose of this invention is spoiled, other publicly known additive agents may contain the constituent concerning this invention. The organic matter etc. which have waxes, colorant, lubricant, a crystallization accelerator besides being a reinforcing member, inorganic matter or an organic filler, an antioxidant, a thermostabilizer, an ultraviolet ray absorbent, etc., and resolvability like starch as said other publicly known additive agents are mentioned. Even if it uses these independently, and it uses combining plurality, they are not cared about.

[0037]As said reinforcing member, quartz like a glass micro bead, carbon fiber, and the chalk (novoculite), for example, a NOBOKYU light, asbestos, feldspar, mica, talc, a silicate like wollastonite, kaolin, etc. are mentioned, for example. As an inorganic filler, for example, alumina besides carbon and a silicon dioxide, Metal oxidation particles, for example, talc, such as silica, magnesia, or a ferrite, Particles, such as silicate, such as mica, kaolin, and zeolite, barium sulfate, calcium carbonate, or fullerene, etc. as an organic filler again for example, An epoxy resin, melamine resin, urea resin, an acrylic resin, phenol resin, polyimide resin, polyamide resin, polyester resin, or Teflon (registered trademark) resin is mentioned. Especially, carbon and a silicon dioxide are preferred. The above-mentioned filler may mix and use one sort or two sorts or more.

[0038]As said antioxidant, a phenol system, an amine system, the Lynn system, a sulfur system, a hydroquinone system, or a quinoline antioxidant is mentioned, for example. As a phenolic antioxidant, hindered phenols. For example, 2,6-di-t-butyl-p-cresol, 1,3,5-trimethyl 2,4,6-tris(3,5-di-t-butyl-4-hydroxybenzyl) benzene, 2,2'-methylenebis (4-methyl-6-t-butylphenol), 4,4'-methylenebis (2,6-di-t-butylphenol), 4,4'-butylidenebis (3-methyl-6-t-butylphenol), C₂₋₁₀ alkylene diol-screws, such as 1,6-hexane *****-**** [3-(3,5-di-t-butyl-4-hydroxyphenyl) propionate] [3-(3,5-di-branching C₃₋₆ alkyl 4-hydroxyphenyl) propionate], For example, triethylene glycol screw [3-(3-t-butyl-5-methyl-4-hydroxyphenyl) JI or TORIOKISHI C₂₋₄ alkylene diol-screws [3-(3,5-di-branching C₃₋₆ alkyl 4-hydroxyphenyl) propionate], such as propionate], For example, C₃₋₈ alkanetriol-screws, such as glycerin tris [3-(3,5-di-t-butyl-4-hydroxyphenyl) propionate] [3-(3,5-di-branching C₃₋₆ alkyl 4-hydroxyphenyl) propionate], For example, pentaerythritol tetrakis [3-(3,5-di-t-butyl-4-hydroxyphenyl) C₄₋₈ alkanetetraol tetrakis, such as propionate] [3-(3,5-di-branching C₃₋₆ alkyl 4-hydroxyphenyl) propionate], For example, n-octadecyl-3-(4',5'-di-t-butylphenol) propionate, n-octadecyl-3-(4'-hydroxy-3',5'-di-t-butylphenol) propionate, Stearyl 2-(3,5-di-t-butyl-4-hydroxyphenol) propionate, Distearyl 3,5-di-

t-butyl-4-hydroxybenzyl phosphonate, 2-t-butyl-6-(3-t-butyl-5-methyl-2-hydroxybenzyl)-4-methylphenyl acrylate, N,N'-hexa methylenebis (3,5-di-t-butyl-4-hydroxy-hydronalium SHIMMU amide), A 3,9-screw {2-[3-(3-t-butyl-4-hydroxy-5-methylphenyl) propionyloxy]-1,1-dimethylethyl}-2,4,8,10-tetraoxaspiro [5, 5] undecane, 4,4'-thiobis(3-methyl-6-t-butylphenol) or 1,1,3-tris(2-methyl-4-hydroxy-5-t-butylphenol) butane is mentioned.

[0039]As an amine system antioxidant, phenyl-1-naphthylamine, phenyl-2-naphthylamine, a N,N'-diphenyl-1,4-phenylenediamine, or an N-phenyl-N'-cyclohexyl-1,4-phenylenediamine is mentioned, for example.

[0040]As a Lynn system antioxidant, for example Tri-isodecyl phosphite, Triphenyl phosphite, tris nonylphenyl phosphite, diphenyl isodecyl phosphite, Phenyl di-isodecyl phosphite, 2,2-methylene bis(4,6-di-t-butylphenyl)octyl phosphite, 4,4'-butylidenebis (3-methyl-6-t-butylphenyl) ditridecyl phosphite, Tris (2,4-di-t-butylphenyl) phosphite, tris (2-t-butyl-4-methylphenyl) phosphite, Tris (2,4-di-t-amyl phenyl) phosphite, tris (2-t-butylphenyl) phosphite, Bis(2-t-butylphenyl)phenyl phosphite, tris [2 -(1,1-dimethylpropyl)- phenyl] phosphite, Tris [2,4 -(1,1-dimethylpropyl)- phenyl] phosphite, Phosphite compounds, such as tris (2-cyclohexylphenyl) phosphite and tris (2-t-butyl-4-phenylphenyl) phosphite; Triethylphosphine, TORIPURO pill phosphine, tributyl phosphine, tri-cyclohexyl phosphine, Diphenylvinylphosphine, allyl diphenylphosphine, triphenyl phosphine, Methylphenyl p-anisyl phosphine, p-anisyl diphenylphosphine, p-tolyl diphenylphosphine, di-p-anisyl phenylphosphine, Di-p-tolyl phenylphosphine, tri-m-aminophenyl phosphine, Tri-2,4-dimethylphenyl phosphine, the tri- 2 and 4, 6 **TORI methylphenyl phosphine, Phosphine compounds, such as tri-o-tolyl phosphine, tri-m-tolyl phosphine, tri-p-tolyl phosphine, tri-o **ANI sill phosphine, tri-p-anisyl phosphine, or 1,4-bis(diphenylphosphino)butane, etc. are mentioned.

[0041]As a hydroquinone system antioxidant, they are mentioned by 2,5-di-t-butylhydroquinone etc. and, for example as a quinoline antioxidant, For example, 6-ethoxy-2,2,4-trimethyl 1,2-dihydroquinoline etc. are mentioned, and dilauryl thiodipropionate, distearyl thiodipropionate, etc. are mentioned as a sulfur system antioxidant, for example. Especially, as a desirable antioxidant, a phenolic antioxidant (especially hindered phenols), for example, polyol poly [(branching C₃₋₆ alkyl group and hydroxy group substituted phenyl) propionate] etc., is mentioned. An antioxidant is independent or may be used two or more sorts.

[0042]As said thermostabilizer, for example Polyamide, the Polly beta-alanine copolymer, Polyacrylamide, polyurethane, melamine, cyanoguanidine, nitrogen containing compound [, such as basic nitrogen containing compounds, such as a melamineformaldehyde condensation product,]; -- organic-carboxylic-acid metal salt (calcium stearate.) metallic oxides (magnesium oxide.), such as 12-hydroxycalcium stearate Alkali or alkaline-earth-metals content compounds, such as metal hydroxide (magnesium hydroxide, calcium hydroxide, aluminium

hydroxide, etc.), such as a calcium oxide and an aluminum oxide, and metallic carbonate; zeolite; or a hydrotalcite is mentioned. In particular, alkali or an alkaline-earth-metals content compound (especially alkaline-earth-metals content compounds, such as a magnesium compound and a lime compound), zeolite, or a hydrotalcite is preferred. A thermostabilizer is independent or may be used two or more sorts.

[0043]As the above-mentioned ultraviolet ray absorbent, a publicly known benzophenone series, a benzotriazol system, a cyanoacrylate system, a salicylate series, or an oxalic acid anilide system is mentioned conventionally. For example, a [2-hydroxy-4-(methacryloyl oxyethoxy) benzophenone]-methyl methacrylate copolymer, [2-hydroxy-4-(meta-KURIROIUOKI methoxy) benzophenone] - methyl methacrylate copolymer, [2-hydroxy-4-(methacryloyloxy octoxy) benzophenone] - methyl methacrylate copolymer, [2-hydroxy-4-(methacryloyloxy dodecyloxy) benzophenone] - methyl methacrylate copolymer, [2-hydroxy-4-(methacryloyloxy benzyloxy) benzophenone] - methyl methacrylate copolymer, [2,2'-dihydroxy-4-(methacryloyl oxyethoxy) benzophenone] - methyl methacrylate copolymer, [2,2'-dihydroxy-4-(methacryloyloxy methoxy) benzophenone] - methyl methacrylate copolymer or [2,2'-dihydroxy-4-(methacryloyloxy octoxybenzophenone)- A methyl methacrylate copolymer etc. are mentioned. An ultraviolet ray absorbent is independent or may be used two or more sorts.

[0044]As said lubricant, for example Petroleum system lubricating oil; halogenated hydrocarbon, such as a liquid paraffin, Synthetic oil, such as a diester oil, silicone oil, and fluoride silicon; various denaturation silicone oil (it and) [epoxy-] Amino modifying, alkyl modification, ;, such as polyether denaturation. silicon system lubricant substance [, such as a copolymer of organic compounds, such as polyoxy alkylene glycol, and silicon,]; -- silicon copolymer; -- various fluorochemical surfactant [, such as a fluoro alkyl compound,]; -- fluorine systems, such as trifluoromethylene chloride low polymer, -- lubricous -- substance; paraffin wax. Waxes, such as polyethylene wax; high-class fatty alcohol, high-class aliphatic series amide, higher-fatty-acid ester, higher fatty acid salt, or molybdenum disulfide is mentioned. Also in these, use of a silicon copolymer (what polymerized silicon by the block or the graft to resin) is preferred especially. As a silicon copolymer, acrylic resin, polystyrene system resin, Poly nitrile system resin, polyamide system resin, polyolefin system resin, epoxy system resin, It is preferred to poly butyral system resin, melamine system resin, VCM/PVC system resin, polyurethane system resin, or polyvinyl ether system resin a block or for what is necessary to be just to carry out graft polymerization, and to use a silicon graft copolymer for silicon. The number of these lubricous substances may be one, and they may be used combining two or more sorts.

[0045]As the above-mentioned waxes, for example Olefin system waxes and paraffin wax, such as polypropylene wax and polyethylene wax, Fischer -- fatty tuna -- a push wax, microcrystalline wax, a montan wax, a fatty-acid-amide system wax, a high-class fatty alcohol

system wax, a higher-fatty-acid system wax, a fatty-acid-ester system wax, carnauba wax, a rice wax, etc. are mentioned. These waxes may be used independently and they may be used together combining two or more sorts.

[0046]As said colorant, an inorganic pigment, an organic color, or a color is mentioned. As an inorganic pigment, chromium system paints, cadmium system paints, iron system paints, cobalt system paints, ultramarine, or Prussian blue is mentioned, for example. As a concrete example of an organic color or a color, For example, carbon black;, for example, phthalocyanine pigment; like phthalocyanine copper, for example, Quinacridone magenta, Quinacridone pigment;, for example, Hansa yellow, like the Quinacridone red, The Nigrosine base, azo pigment;, for example, spirit black SB, like Diarylide Yellow, permanent yellow, Permanent Red, and naphthol red, nigrosine dye like the oil black BW, oil blue, or alkali blue is mentioned. Colorant is independent or may be used two or more sorts.

[0047]As said crystallization accelerator, for example p-t-butylsodium benzoate, Sodium montanate, calcium montanate, pulmitic acid sodium, Metallic oxides, such as mineral [, such as organic-acid-salt /, such as calcium stearate, /;, for example calcium carbonate, a calcium silicate, a magnesium silicate calcium sulfate, barium sulfate and talc,];, for example, a zinc oxide, magnesium oxide, and titanium oxide, etc. are mentioned. These crystallization accelerators may be used by one sort, and may be used combining two or more sorts.

[0048]Publicly known processing may be performed to the constituent concerning this invention. For example, in order to control hydrolysis of the biodegradable polymer compound in the constituent concerning this invention, it may be made to irradiate with an activity energy line to the constituent concerning this invention. As said source of an activity energy line, electromagnetic waves, an electron beam or corpuscular beams, and such combination are mentioned, for example. As electromagnetic waves, ultraviolet rays (UV), X-rays, etc. are mentioned and the line of elementary particles, such as a proton and a neutron, is mentioned as a corpuscular beam. The electron beam irradiation by use of an electron accelerator is preferred also in especially inside.

[0049]It can irradiate with the above-mentioned activity energy line using a publicly known device. For example, a UV irradiation device, an electron accelerator, etc. are mentioned. As an exposure dose and irradiation intensity, in the constituent concerning this invention, if it is a range effectively delayed in hydrolysis of a biodegradable polymer compound, it will not be limited in particular. For example, in the case of an electron beam, about about 100-5000 kV has preferred accelerating voltage, and it is preferred as an exposure dose that they are about 1 or more kGy.

[0050]The constituent concerning this invention is applicable to various uses. For example, molded products, such as a case of electric products, such as radio, a microphone, TV, a keyboard, a portable music reproduction machine, and a personal computer, are obtained,

using the constituent concerning this invention. Said molded product can be used not only for the case of an electric product but for other uses, such as a packing material. As a forming process of said molded product, for example, film shaping, extrusion molding, or injection molding is mentioned, and injection molding is preferred also in especially inside. More specifically, extrusion molding can be performed in accordance with a conventional method using publicly known extruding press machines, such as a single screw extruder, a multi-screw extruder, and a tandem extrusion machine. In accordance with a conventional method, an injection molding machine with publicly known inline screw type injection machine, multilayer injection molding machine, two-animals type injection molding machine, etc. can perform injection molding.

[0051]

[Example] Although stated in detail below, comparing the example of this invention with a comparative example, it cannot be overemphasized that this invention is not limited to this.

[Examples 1-8, the comparative example 1]

(Adjustment of a sample) As biodegradable resin (A), the reagent was used as it was using Rey Xia (H100J, Mitsui Chemicals, Inc. make) belonging to polylactic acid about various fire-resistant system additive agents (B) and hydrolysis inhibitor (C). The melt kneading method was used for mixing of A, B, and C. As kneading conditions, minimax mix RUDA (made by Oriental energy machine incorporated company) was used as a kneading machine, 170-175 ** and torque were 4-6 kg, holding time was made into less than 3 seconds, and nozzle temperature was added by kneading. After grinding the obtained resin complex, it pressed 300 kg/cm² at 170 **, after molding into a 1.0-mm-thick plate, was cut down to 12.7 mm x 127 mm, and used it as the specimen.

[0052] The presentation list of the samples produced for the example and the comparative example (presentation; weight section) is shown below.

[Table 1]

	生分解性樹脂	難燃系添加剤	加水分解抑制剤
実施例 1	ポリ乳酸 ; 83	$\text{Al}(\text{OH})_3$; 15	ジシクロヘキシル カルボジイミド ; 2
実施例 2	ポリ乳酸 ; 68	$\text{Al}(\text{OH})_3$; 30	ジシクロヘキシル カルボジイミド ; 2
実施例 3	ポリ乳酸 ; 83	$\text{Mg}(\text{OH})_2$; 15	ジシクロヘキシル カルボジイミド ; 2
実施例 4	ポリ乳酸 ; 68	$\text{Mg}(\text{OH})_2$; 30	ジシクロヘキシル カルボジイミド ; 2
実施例 5	ポリ乳酸 ; 88	$(\text{NH}_4)_3(\text{P}_3\text{O}_{3n+1})^{(n+2)}$; 10	ジシクロヘキシル カルボジイミド ; 2
実施例 6	ポリ乳酸 ; 78	$(\text{NH}_4)_3(\text{P}_3\text{O}_{3n+1})^{(n+2)}$; 20	ジシクロヘキシル カルボジイミド ; 2
実施例 7	ポリ乳酸 ; 78	SiO_2 ; 20	ジシクロヘキシル カルボジイミド ; 2
実施例 8	ポリ乳酸 ; 78	低融点ガラス ; 20	ジシクロヘキシル カルボジイミド ; 2
比較例 1	ポリ乳酸 ; 100	—	—

表中、n は整数を表す。

[0053](Burning test) The burning test was done according to UL-94HB using the above-mentioned specimen. The method is described below. Each sample was two places, 25.4 mm and 102 mm, from the end, crossed the sample and drew the line. And the sample was held at the end of the one distant from a 25.4-mm line, the vertical axis was leveled, and the horizontal axis was made to incline 45 degrees. A wire gauze shall be held downward horizontally in a sample, the lower end of a sample and the interval of a wire gauze shall be 9.5 mm, and it was made for the end and the edge of a wire gauze where a sample is not supported to be on the same line. The burner was set in the position which is separated from a sample, and was lit, and it adjusted so that the height of blue flame might be set to 25 mm. Adjust supply of gas, and the airport of a burner first, it is made for the yellow and blue flame of the 25-mm-high point to come out, flame increases the quantity of air after that, and it was made for previous yellow to disappear. Again, the height of flame was measured and was united with 25 mm.

Flame was hit to the lower end of the end which does not hold a sample. Then, the medial axis of a burner tube shall receive horizontally, shall be made to incline about 45 degrees, and shall be in the same vertical plane as the margin inferior of the vertical axis of a sample. By Fukushima who is about 6 mm, the front end of the sample guessed flame for 30 seconds, without moving the position of a burner, and kept away flame from the sample. We decided to stop ****, when the sign line whose flame is 25.4 mm when burning to the sign line whose sample is 25.4 mm before flame hits for 30 seconds was reached. When a sample continues burning even after keeping away flame, time for a sample to burn from the end which is not held to the 102-mm sign line which is not held from a 25.4-mm sign line was timed, and the rate of combustion was computed.

[0054]Below, the result of the burning test to the specimen obtained by the example and the comparative example is shown.

[Table 2]

	燃焼速度
実施例 1	102mmの標線手前で消火
実施例 2	102mmの標線手前で消火
実施例 3	102mmの標線手前で消火
実施例 4	102mmの標線手前で消火
実施例 5	102mmの標線手前で消火
実施例 6	102mmの標線手前で消火
実施例 7	57.4 (mm/分)
実施例 8	102mmの標線手前で消火
比較例 1	81.2 (mm/分)
参考	76.2 (mm/分)

なお、表中参考とは、UL-94HBの規格値を示す。

[0055]From the upper table, flameproofing of the constituent in which the sample of Examples 1-8 has biodegradability is realized compared with the comparative example 1. And the rate of combustion of the sample of Examples 1-8 fully fulfills a UL-94HB standard.

[0056][Examples 9-11, the comparative example 2] The presentation list of the samples produced for the example and the comparative example (presentation; weight section) is shown below. Adjustment of the sample was performed by the same method as the above.

[0057]

[Table 3]

	生分解性樹脂	難燃系添加剤	加水分解制御剤
実施例 9	ポリ乳酸 ; 93	タルク ; 5	ジシクロヘキシル カルボジイミド; 2
実施例 10	ポリ乳酸 ; 83	タルク ; 15	ジシクロヘキシル カルボジイミド; 2
実施例 11	ポリ乳酸 ; 68	タルク ; 30	ジシクロヘキシル カルボジイミド; 2
比較例 2	ポリ乳酸 ; 98	—	ジシクロヘキシル カルボジイミド; 2

[0058](A burning test - the level) The horizontal-firing examination was done according to UL-94HB using the above-mentioned specimen. The method is described below. Each sample was two places, 25.4 mm and 102 mm, from the end, crossed the sample and drew the line. And the sample was held at the end of the one distant from a 25.4-mm line, the vertical axis was leveled, and the horizontal axis was made to incline 45 degrees. A wire gauze shall be held downward horizontally in a sample, the lower end of a sample and the interval of a wire gauze shall be 9.5 mm, and it was made for the end and the edge of a wire gauze where a sample is not supported to be on the same line. The burner was set in the position which is separated from a sample, and was lit, and it adjusted so that the height of blue flame might be set to 25 mm. Adjust supply of gas, and the airport of a burner first, it is made for the yellow and blue flame of the 25-mm-high point to come out, flame increases the quantity of air after that, and it was made for previous yellow to disappear. Again, the height of flame was measured and was united with 25 mm. Flame was hit to the lower end of the end which does not hold a sample. Then, the medial axis of a burner tube shall receive horizontally, shall be made to incline about 45 degrees, and shall be in the same vertical plane as the margo inferior of the vertical axis of a sample. By Fukushima who is about 6 mm, the front end of the sample guessed flame for 30 seconds, without moving the position of a burner, and kept away flame from the sample. We decided to stop ****, when the sign line whose flame is 25.4 mm when burning to the sign line whose sample is 25.4 mm before flame hits for 30 seconds was reached. When a sample continues burning even after keeping away flame, time for a sample to burn from the end which is not held to the 102-mm sign line which is not held from a 25.4-mm sign line was timed, and the rate of combustion was computed. And 94HB authorization material, i.e., the material recognized as 94HB, must suit a combustion stop, and (b) 76.2-mm two conditions of the following by /in 102 mm (a) this side.

[0059](A burning test - a perpendicular) The vertical flame test was done according to UL-94V0 - 2 using the above-mentioned specimen. The method is described below. each sample -- the horizontal bed of the upper bed to 6.4 mm absorbent cotton for surgery which made the

vertical axis vertical by the way, and was held by the clamp of the ring stand, and the tip of the burner dried downward under 9.5 mm from the lower end of the sample at 305 mm -- ** -- it is made like. In order to make a horizontal bed, by the thumb and an index finger, the wafer like about 12.7 mmX(s)25.4mm is torn, and it extends thinly with a finger from the lump of cotton, and is made for natural thickness to be set to 6.4 mm by 50.8-mm square. A burner is set in the position which is separated from a sample, and is lit, and it adjusts so that 19-mm-high blue flame may come out. Flame adjusts the amount of supply of gas, and the airport of a burner, first, it is made for the yellow and blue flame of the 19-mm-high point to come out, and it carries out it.

Then, the quantity of ** is adjusted and it is made for previous yellow flame to be lost. The height of flame is measured once again and it adjusts if needed.

[0060]Examination flame is hit to the center of the lower end of a test sample, and it continues as it is for 10 seconds. And flame is detached at least 152 mm and a sample records time to take out flame and burn. Shortly after the flame of a sample disappears, examination flame is again applied to the lower end of a sample. And in 10 seconds, flame is detached again and the burning time of owner flame and flashless is recorded. When it is difficult to identify the owner flame and flashless by viewing, the cotton for surgery is contacted in the interrogative part. It will be owner flame if cotton lights. When fusion or an owner flame substance trickles from a sample during each approaching flame, it may avoid that make a burner incline to the angle of 45 degrees during the approaching flame, keep away a few from either of the 12.7-mm fields of a sample very much further again, and material trickles into a burner tube. When fusion or an owner flame substance trickles from a sample or it continues burning during an examination, a burner must be made into a stock and, as for under an approaching flame, a 9.5-mm interval must be held between the lower end of a sample, and the tip of a burner tube. Dropping of all the fusion materials shall be disregarded and an approaching flame must be carried out in the center of a sample.

[0061]And 94V-2 authorization material, i.e., the material recognized as 94V-2, must suit the following conditions.

- (a) After applying flame each time, all trial production should take out flame 30 seconds or more, and should not burn.
- (b) Perform a total of ten approaching flames in the sample of five each class, and the sum total of time to take out flame and burn should not exceed 250 seconds.
- (c) Combustion of owner flame or flashless should not attain all the sample to a support clamp.
- (d) It is allowed to light the dry absorbent cotton for surgery where a sample trickles a substance and which has it under 305 mm.
- (e) Not all the sample should continue combustion of flashless 60 seconds or more, after

keeping away flame to the second time.

[0062]Below, the result of the above-mentioned burning test to the specimen obtained by Examples 9-11 and the comparative example 2 is shown.

[Table 4]

	水平燃焼試験	垂直燃焼試験
実施例 9	102mm の標線手前で消火	UL94-V2 ; ○
実施例 10	102mm の標線手前で消火	UL94-V2 ; ○
実施例 11	102mm の標線手前で消火	UL94-V2 ; ○
比較例 2	93.5mm/分	UL94-V2 ; ×

It is shown among front that "UL94-V2;O" is 94V-2 authorization material, and it is shown that "UL94-V2;x" is not 94V-2 authorization material.

[0063]From the upper table, flameproofing of the constituent in which the sample of Examples 9-11 has biodegradability is realized compared with the comparative example 2. And the rate of combustion of the sample of Examples 9-11 fully fulfills a UL-94HB standard. And UL-94V2 is fully filled.

[0064][Examples 12-19, the comparative example 3] The presentation list of the samples produced for the example and the comparative example (presentation; weight section) is shown below. Adjustment of the sample was performed by the same method as the above.

[Table 5]

	生分解性樹脂	難燃系添加剤	加水分解制御剤
実施例 12	ポリ乳酸 ; 93	水酸化アルミニウム ; 5	ジシクロヘキシル カルボジイミド; 2
実施例 13	ポリ乳酸 ; 88	水酸化アルミニウム ; 10	ジシクロヘキシル カルボジイミド; 2
実施例 14	ポリ乳酸 ; 78	水酸化アルミニウム ; 20	ジシクロヘキシル カルボジイミド; 2
実施例 15	ポリ乳酸 ; 68	水酸化アルミニウム ; 30	ジシクロヘキシル カルボジイミド; 2
実施例 16	ポリ乳酸 ; 48	水酸化アルミニウム ; 50	ジシクロヘキシル カルボジイミド; 2
実施例 17	ポリ乳酸 ; 93	水酸化マグネシウム ; 5	ジシクロヘキシル カルボジイミド; 2
実施例 18	ポリ乳酸 ; 73	水酸化マグネシウム ; 25	ジシクロヘキシル カルボジイミド; 2
実施例 19	ポリ乳酸 ; 48	水酸化マグネシウム ; 50	ジシクロヘキシル カルボジイミド; 2
比較例 3	ポリ乳酸 ; 98	—	ジシクロヘキシル カルボジイミド; 2

[0065]The horizontal-firing examination and the vertical flame test were done on below by the completely same method as the above to the specimen obtained by Examples 12-19 and the comparative example 3. The result is shown in the following table.

[0066]

[Table 6]

	水平燃焼試験	垂直燃焼試験
実施例 12	102mm の標線手前で消火	UL94-V2; ○
実施例 13	102mm の標線手前で消火	UL94-V2; ○
実施例 14	102mm の標線手前で消火	UL94-V2; ○
実施例 15	102mm の標線手前で消火	UL94-V2; ○
実施例 16	102mm の標線手前で消火	UL94-V2; ○
実施例 17	102mm の標線手前で消火	UL94-V2; ○
実施例 18	102mm の標線手前で消火	UL94-V2; ○
実施例 19	102mm の標線手前で消火	UL94-V2; ○
比較例 3	93.5mm/分	UL94-V2; ×

It is shown among front that "UL94-V2;O" is 94V-2 authorization material, and it is shown that "UL94-V2;x" is not 94V-2 authorization material.

[0067]From the upper table, flameproofing of the constituent in which the sample of Examples 12-19 has biodegradability is realized compared with the comparative example 3. And the rate of combustion of the sample of Examples 12-19 fully fulfills a UL-94HB standard. And UL-94V2 is fully filled.

[0068]

[Effect of the Invention]The constituent which has biodegradability, fire retardancy, and a mechanical strength is realizable to the raw material containing biodegradable polymer compounds, such as biodegradable resin, by adding a fire-resistant system additive agent and hydrolysis inhibitor of said biodegradable polymer compound. That is, although the constituent of this invention has high fire retardancy, at the time of abandonment, to a living body or earth environment, it decomposes into a safe ingredient, for example, alumina and water, a diacid carbonizing, etc., and it does damage to neither peripheral environment nor a human body. As compared with existing it, sufficient environmental consideration is realized by using the constituent concerning this invention for the case and packing material of an electric product.

[Translation done.]

TECHNICAL FIELD

[Field of the Invention] This invention relates to the constituent which can reduce the adverse effect to environment by carrying out biodegradation, when fire retardancy is given and it is discarded by natural environment.

[Translation done.]

PRIOR ART

[Description of the Prior Art] Various kinds of synthetic resin materials are developed and provided, the amount used in various fields of industry increases every year in recent years, and about 10 million t per year of a variety of synthetic resins came to be produced. As the result, the quantity of synthetic resin waste also increases and the processing serves as a big social problem. Harmful gas may be emitted, or carrying out incineration processing of the discarded resin as it is may cause damage to an incinerator with big combustion heat, and it is to give big load to environment.

[0003] There is a method from which it has reclaimed land enough and which incinerates what carried out depolymerize of the abandonment resin, for example by a pyrolysis or chemical decomposition as a disposal method of the abandonment resin known conventionally, or is carried out. However, in order to accompany incineration processing by emission of carbon dioxide, there is a possibility of causing global warming. When sulfur, nitrogen, or halogen contains in incineration resin, it becomes a cause of the air pollution by a toxic exhaust gas to carry out incineration processing. On the other hand, when reclaiming land from resin, since almost all the resin used remains in the state as it is, without being decomposed for a long period of time, it causes soil pollution now. Then, biodegradable resin is being developed and put in practical use to such a problem in recent years. Since it is biochemically decomposed into carbon dioxide, water, etc. by the microorganism etc., when discarded to natural environment, it decomposes easily, and low molecule quantification is carried out and biodegradable resin changes to a harmless compound to environment. Therefore, the adverse effect to the earth environment accompanying abandonment can be reduced by using biodegradable resin. Since it is such, its attention is paid to biodegradable resin and utilization is advanced to the disposable products mainly concerned with daily-use products, sanitary goods, or a play article until now.

[0004] As mentioned above, about fire retardancy with the demand increasing as one of the safeties at the time of resin actually being used for conventional biodegradable resin, although the safety to natural environment is secured, existing biodegradable resin is not enough. Although there is a request of liking to form a case etc. with biodegradable resin and to make processing after recovery easy especially about an electric product, in order to use it as a case of an electric product, It is necessary to fulfill the fire-resistant standard provided in Japanese Industrial Standard (JIS) or UL (Under-writer Laboratory) standard, and cannot respond to said fire-resistant standard in existing biodegradable resin. When applying biodegradable resin to daily necessities, such as cases, such as an electric product and electronic equipment, a conservation characteristic (endurance in homiothermal constant humidity conditions) is required with the above-mentioned fire retardancy. For example, in small audio goods, it is

required to maintain physical properties, such as intensity, three to seven years on 30 ** and the conditions of 80% of relative humidity.

[0005] Various examination is performed in order to give conventionally the physical properties which were suitable for practical mold goods to biodegradable resin. For example, aliphatic polyester resin which is an example of representation of biodegradable polymer is received, Improvement in the crystallization rate by addition of an inorganic filler and addition of a nucleus agent and a glass transition point about the molded product using such plastics, such as a blend with the biodegradable resin in which low rubber character is shown, Some patent application is already made (JP,3-290461,A, JP,4-146952,A, JP,4-325526,A, etc.). However, especially these molded products are used as a film or wrapping. About physical properties, such as fire retardancy or a mechanical strength, it is not enough.

[Translation done.]

EFFECT OF THE INVENTION

[Effect of the Invention]The constituent which has biodegradability, fire retardancy, and a mechanical strength is realizable to the raw material containing biodegradable polymer compounds, such as biodegradable resin, by adding a fire-resistant system additive agent and hydrolysis inhibitor of said biodegradable polymer compound. That is, although the constituent of this invention has high fire retardancy, at the time of abandonment, to a living body or earth environment, it decomposes into a safe ingredient, for example, alumina and water, a diacid carbonizing, etc., and it does damage to neither peripheral environment nor a human body. As compared with existing it, sufficient environmental consideration is realized by using the constituent concerning this invention for the case and packing material of an electric product.

[Translation done.]

TECHNICAL PROBLEM

[Problem(s) to be Solved by the Invention]Then, this invention has few adverse effects to the natural environment at the time of abandonment, and an object of this invention is to provide the constituent which has biodegradability, fire retardancy, and a mechanical strength.

[Translation done.]

MEANS

[Means for Solving the Problem] This invention persons did the knowledge of the above-mentioned technical problem being solvable to biodegradable resin by adding a fire-resistant system additive agent and hydrolysis inhibitor of biodegradable resin. Although a flameproofing agent of a halogen system is mentioned as a fire-resistant system additive agent, since halogen gas is emitted at the time of incineration processing of this resin and complicated processing is needed for making this halogen gas harmless to a human body when a flameproofing agent of a halogen system is included in resin, it cannot be said as a suitable example.

[0008] Then, artificers paid their attention to ** hydroxide system compound, ** ammonium phosphate system compound, and ** silica system compound as a fire-resistant system additive agent in which environment was considered. ** A hydroxide system compound produces water at the same time such materials carry out the endothermic of the heat generated when resin burns and it decomposes, and it reveals fire retardancy by an endothermic action and generating of water. ** Decompose at the time of combustion, and an ammonium phosphate system compound generates polymetaphosphate, and demonstrates a fire-resistant effect by oxygen interception by formation of carbon coating generated newly as a result of the dehydrating action. ** A silica system compound gives fire retardancy to resin by an effect of an inorganic filler to resin. Flameproofing of resin is realized by combining biodegradable resin and a fire-resistant system additive agent of the above-mentioned ** - **.

[0009] By adding hydrolysis inhibitor of biodegradable resin to this compound resin further, as a result of this invention persons' considering improvement containing biodegradable resin and a fire-resistant system additive agent of the above-mentioned ** - ** in a mechanical strength of said compound resin, A hydrolysis rate of biodegradable resin in said compound resin was delayed, and knowledge that a mechanical strength of said compound resin was held rather than former for a long period of time at the reason was acquired. As mentioned above, this invention persons came to invent ideal resin which it was using a ternary system of biodegradable resin, a fire-resistant system additive agent, and hydrolysis inhibitor, was new, and has biodegradability, fire retardancy, and a mechanical strength.

[0010] That is, this invention is (1). An organic polymer compound which has 1 or two or more sorts of biodegradability, A constituent containing a fire-resistant system additive agent and hydrolysis inhibitor of an organic polymer compound which has said biodegradability, An organic polymer compound which it has biodegradability (2) Polysaccharide, aliphatic polyester, Polyamino acid, polyvinyl alcohol, or polyalkylene glycol, Or a constituent of the aforementioned (1) statement being a copolymer containing any at least one of said the compounds, Aliphatic polyester (3) Polylactic acid, a polycaprolactone, poly hydroxy butanoic

acid, A polyhydroxy valeric acid, polyethylene succinate, polybutylene succinate, It is related without a constituent of the aforementioned (1) statement being a polybutylene horse mackerel peat, polymalic acid, microorganism synthetic polyester, or a copolymer containing any at least one of said the compounds.

[0011]This invention is (4). A constituent of the aforementioned (1) statement, wherein fire-resistant system additive agents are at least one sort of compounds chosen from a hydroxide system compound, the Lynn system compound, and a silica system compound, (5) A constituent of the aforementioned (4) statement, wherein a fire-resistant system additive agent is a hydroxide system compound of not less than 99.5% of purity, (6) A constituent of the aforementioned (4) statement, wherein a fire-resistant system additive agent is a hydroxide system compound of particle state below 5.0 μm of BET specific surface area m^2/g , (7) A constituent of the aforementioned (4) statement, wherein a fire-resistant system additive agent is a hydroxide system compound of particle state with a mean particle diameter of 100 micrometers or less, (8) A constituent of the aforementioned (4) statement in which a fire-resistant system additive agent is characterized by content of a silica dioxide being not less than 50% of silica system compound, and (9) A fire-resistant system additive agent is related without a constituent of the aforementioned (4) statement being a silica system compound of particle state with a mean particle diameter of 50 micrometers or less.

[0012]This invention is (10). Hydrolysis inhibitor Carbodiimide compound, A constituent of the aforementioned (1) statement being at least one sort of compounds chosen from an isocyanate compound and an oxo ZORIN compound, and (11) An organic polymer compound which has 1 or two or more sorts of biodegradability, A manufacturing method of a constituent of the aforementioned (1) statement compounding a fire-resistant system additive and hydrolysis inhibitor of an organic polymer compound which has said biodegradability, (12) Mold goods and (13) which consist of a constituent of the aforementioned (1) statement Mold goods given in the above (12) being a case of an electric product, and (14) It is related without an electric product which makes a component parts which become the above (1) from a constituent of a statement.

[0013]

[Embodiment of the Invention]Next, about the constituent of this invention, the constituent and manufacturing method are described below. As an organic polymer compound (henceforth a "biodegradable polymer compound") which has the biodegradability used by this invention, If a microorganism involves in a nature and after use are a low molecular weight compound and a compound (Biodegradable Plastics Society, ISO/TC-207/SC3) eventually disassembled into water and carbon dioxide, there will be no restriction in particular. As a biodegradable polymer compound, biodegradable resin is preferred. The polysaccharide which specifically has biodegradability as biodegradable resin, The copolymer of either peptide, aliphatic polyester,

polyamino acid, polyvinyl alcohol, polyamide or polyalkylene glycol and said compound etc. which contain one of one at least are mentioned. Especially, since aliphatic polyester is excellent in mixing nature or mass production nature, it is preferred as a biodegradable polymer compound used by this invention. As said aliphatic polyester, polylactic acid, such as a random copolymer of Poly L-lactic acid (PLLA), L-lactic acid, and D-lactic acid, or those derivatives are more preferred. For example, the polycaprolactone classified into other polyester, of course, Poly hydroxy butanoic acid, a polyhydroxy valeric acid, polyethylene succinate, Polybutylene succinate, polybutylene horse mackerel peat, polymalic acid, polyglycolic acid, polysuccinate, polyoxalic-acid-ester, and butylene polydiglycolate and polydioxanone, it is usable in microorganism synthetic polyester etc. Here, as microorganism synthetic polyester, 3-hydroxy butyrate (3HB), 3-hydroxy BARIRETO (3HV), or its copolymer is mentioned.

[0014]As the above-mentioned polysaccharide, either cellulose, starch, chitosan, dextran or these derivatives and the copolymer containing these one can be mentioned. Collagen, casein, fibrin, gelatin, etc. are mentioned as the above-mentioned peptide. As the above-mentioned polyamide, the nylon 4, nylon 2 / nylon 6 copolymer, etc. are mentioned, for example.

[0015]Although there is biodegradability in low molecular weight, if biodegradability comes to be acquired by graft copolymerization with the biodegradable polymer compound illustrated above, etc. even if it is a biodegradable low organic polymer compound, in this invention, this can be used in the amount of polymers. Specifically in such an amount of polymers, polyethylene, a polyacrylic acid derivative, polypropylene, polyurethane, etc. are mentioned as a biodegradable low organic polymer compound, for example. About the molecular weight and end group of these resin, if mechanical intensity is obtained, there will be no restriction in particular.

[0016]The biodegradable polymer compound used by this invention can be manufactured in accordance with a publicly known method. For example, biodegradable polyester can be manufactured by methods, such as the ** lactide method, a polycondensation of ** polyhydric alcohol and polybasic acid, or an intermolecular polycondensation of the hydroxycarboxylic acid which has a hydroxyl group and a carboxyl group in ** intramolecular.

[0017]In the fire-resistant system additive in this invention, there is no restriction in particular in the compound which can be used. As said fire-resistant system additive, various kinds of boric acid system fire retardancy compounds, the Lynn system fire retardancy compound, an inorganic system fire retardancy compound, the Chisso system fire retardancy compound, a halogen system fire retardancy compound, an organic system fire retardancy compound, a colloidal system fire retardancy compound, etc. are mentioned, for example. the fire-resistant system additive shown below -- a kind -- or two or more sorts may be used.

[0018]As a boric acid system fire retardancy compound, the compound containing boric acid,

such as a zinc borate hydrate, barium metaboric acid, and way sand, etc. are mentioned, for example. As a Lynn system fire retardancy compound, for example Ammonium phosphate, ammonium polyphosphate, Melamine phosphate, red phosphorus, phosphoric ester, tris (chloroethyl) phosphate, Tris (monochloro propyl) phosphate, tris (dichloropropyl) phosphate, Triaryl phosphate, tris (3-hydroxypropyl) phosphate, Tris (tribromophenyl) phosphate, tris-beta-chloropropyl phosphate, Tris (dibromophenyl) phosphate, tris (tribromo neopentyl) phosphate, Tetrakis (2-chloroethyl) ethylene diphosphate, dimethylmethyl phosphate, Tris(2-chloroethyl) orthophosphoric acid ester, aromatic condensed-phosphoric-acid ester, Halogen-containing condensation organophosphate, ethylene screw tris (2-cyanoethyl) phosphonium bromide, Ammonium polyphosphate, beta-chloroethyl ASSHIDO phosphate, butyl pyrophosphate, butyl ASSHIDO phosphate, butoxyethyl ASSHIDO phosphate, 2-ethylhexyl ASSHIDO phosphate, a melamine phosphate, halogen-containing phosphonate, Or the compound containing Lynn, such as phenylphosphonic acid, is mentioned.

[0019]As an inorganic system fire retardancy compound, for example Sulfate of zinc, potassium bisulfate, Aluminum sulfate, antimony sulfate, sulfate ester, potassium sulfate, Cobalt sulfate, sodium hydrogensulfate, ferrous sulfate, copper sulfate, sodium sulfate, Sulfuric acid metallic compounds, such as nickel sulfate, barium sulfate, and magnesium sulfate, Iron oxide system combustion catalysts, such as the Amon system fire retardancy compounds, such as ammonium sulfate, and ferrocene, The compound containing titanium, such as nitric acid metallic compounds, such as a cupric nitrate, and titanium oxide, Gold hydroxide groups and those denaturation things, such as carbonate compounds, such as guanidinium system compounds, such as guanidine sulfamate, other zirconium system compounds, a molybdenum system compound, a tin system compound, and potassium carbonate, aluminium hydroxide, or magnesium hydroxide, are mentioned.

[0020]As a Chisso system fire retardancy compound, the cyanurate compound etc. which have a triazine ring are mentioned, for example. As a halogen system fire retardancy compound, for example A chlorinated paraffin, par chlorocyclopentadecane, Hexabromobenzene, decabromo diphenyloxide, bis(tribromophenoxy)ethane, Ethylene screw dibromo norbornane dicarboxyimide, an ethylene screw tetrabromo phthalimide, Dibromoethyldibromocyclohexane, dibromo neopentyl glycol, 2,4,6-tribromophenol, tribromophenyl allyl ether, A tetrabromo bisphenol A derivative, a tetrabromo bisphenol S derivative, Tetradecabromodiphenoxybenzene, tris-(2, 3-dibromopropyl)-isocyanurate, 2,2-bis(4-hydroxy-3,5-dibromophenyl)propane, 2,2-bis(4-hydroxyethoxy-3,5-dibromophenyl)propane, Poly (pentabromobenzyl acrylate), tribromostyrene, Tribromophenyl MAREINIDO, tribromo neopentyl alcohol, tetrabromo dipentaerythritol, pentabromobenzyl acrylate, pentabromophenol, pentabromotoluene, pentabromo diphenyloxide, A hexabromocyclododecane, hexabromodiphenyl ether, octabromo phenol ether,

Octadibromodiphenyl ether, octabromo diphenyloxide, The fire-resistant compound containing halogen, such as magnesiumhydroxide, dibromo neopentyl glycol tetracarbonate, bis (tribromophenyl)fumaramide, N-methylhexabromodiphenylamine, styrene bromide, or diallyl chlorendate, is mentioned.

[0021]As an organic system fire retardancy compound, for example Chlorendic anhydride, phthalic anhydride, Glycidyl compounds, such as a compound containing bisphenol A, and glycidyl ether, Silica system compounds, such as polyhydric alcohol, such as a diethylene glycol and pentaerythritol, denaturation carbamide, silicone oil or a silica dioxide, low melting glass, and the ORGANO siloxane, are mentioned. The aluminium hydroxide which has the fire retardancy currently used from the former as a colloidal system fire retardancy compound, for example, Hydroxide, such as magnesium hydroxide and calcium hydroxide, an ulmin calcium oxide, Colloid of fire-resistant compounds, such as nitric acid compounds, such as hydrates, such as 2 hydration gypsum fibrosum, zinc borate, barium metaboric acid, a borax, and kaolin clay, and sodium nitrate, a molybdenum compound, a zirconium compound, an antimony compound, a dawsonite, or pro GOPAITO, etc. are mentioned.

[0022]As for the fire-resistant system additive in this invention, what does not give load especially to environment in the case of abandonment -- poisonous gas is emitted, for example in the case of incineration disposal -- is preferred. From a viewpoint of such an environmental consideration, as a fire-resistant system additive in this invention, ** For example, hydroxide system compounds, such as aluminium hydroxide, magnesium hydroxide, or calcium hydroxide, ** It is desirable to use silica system compounds, such as ammonium phosphate system compounds, such as the Lynn system compound which was mentioned above especially ammonium phosphate, or ammonium polyphosphate, **, for example, a silica dioxide, low melting glass, or the ORGANO siloxane.

[0023]As a silica system compound suitable as a fire-resistant system additive used by said this invention, the silica system compound whose content of a silica dioxide is not less than about 50% is more preferred. Since a silica system compound is extracted from the mineral of natural origin, this is a certain amount of [substances (for example, MgO , CaO , Fe_2O_3 , aluminum₂O₃, etc.) other than a silica system compound] reason to be contained. However, as for the effect as an inorganic system filler for fire retardancy, not being prevented with an impurity is preferred.

[0024]As a hydroxide system compound suitable as a fire-resistant system additive used by said this invention, that in which the purity is not less than about 99.5% is more preferred. It is because preservation stability when a hydrolysis controlling agent is combined improves, so that the purity of a hydroxide system compound is high. The purity of a hydroxide system compound can be measured by a publicly known method. For example, if the content of the impurity contained in the hydroxide system compound is measured by a publicly known

method and the content of said impurity is subtracted from entire volume, the purity of a hydroxide system compound can be obtained. More specifically, in the case of aluminium hydroxide, Fe_2O_3 , SiO_2 , $\text{T-Na}_2\text{O}$, $\text{S-Na}_2\text{O}$, etc. are mentioned as an impurity, for example. The content of Fe_2O_3 is calculated by O-phenanthroline absorption photometry (JIS H 1901) after dissolving in sodium carbonate boric acid liquid. The content of SiO_2 is calculated by molybdenum blue absorption photometry (JIS H 1901) after dissolving in sodium carbonate boric acid liquid. The content of $\text{T-Na}_2\text{O}$ is frame photometry after dissolving in sulfuric acid, and $\text{S-Na}_2\text{O}$ is called for with frame photometry after warm water extraction. The purity of hydroxide can be obtained by reducing the content calculated by the above from the weight of aluminium hydroxide. If there is not less than 99.5% of purity, of course, it can use combining two or more sorts of different fire-resistant system hydroxide system compounds.

[0025]A granular thing is preferred although the shape in particular of the fire-resistant system additive used by this invention is not limited. The particle diameter can be suitably chosen according to the kind of fire-resistant system additive. For example, it is preferred that the mean particle diameter which is asked for a fire-resistant system additive by laser diffractometry in the case of silica system compounds, such as SiO_2 and glass, is about 50 micrometers or less. Particle size distribution is not asked in this case. It is preferred that the mean particle diameter which is asked for a fire-resistant system additive by laser diffractometry in the case of hydroxide system compounds, such as aluminum(OH)₃, $\text{Mg}(\text{OH})_2$, and $\text{Ca}(\text{OH})_2$, is about 100 micrometers or less. Particle size distribution is not asked in this case. The viewpoint of the injection-molding nature in a molding process or the dispersibility at the time of kneading to mean particle diameter has a preferred mentioned range, and its smaller one also in a mentioned range is more preferred. In order to, raise the filling factor to a constituent, of course, it can use combining two or more sorts of fire-resistant system additive agents in which mean particle diameter differs.

[0026]It is preferred that the BET specific surface area which is asked for a fire-resistant system additive by a nitrogen gas adsorption process in the case of hydroxide system compounds, such as aluminum(OH)₃, $\text{Mg}(\text{OH})_2$, and $\text{Ca}(\text{OH})_2$, uses the particles below about $5.0\text{-m}^2/\text{g}$. In order to, raise the filling factor to a constituent, of course, it can use combining two or more sorts of fire-resistant system hydroxylation compounds in which BET specific surface areas differ. The viewpoint of a moldability to a BET specific surface area has a preferred mentioned range, and its smaller one also in a mentioned range is more preferred.

[0027]The addition of the fire-resistant system additive in this invention can be arbitrarily set in the range which can secure the mechanical intensity of the constituent concerning this

invention. In the case of hydroxide system compounds, such as aluminum(OH)₃, Mg(OH)₂, and Ca(OH)₂, as a concrete addition, a fire-resistant system additive is about about 10 to 40 % of the weight still more preferably about about 7.5 to 45% of the weight preferably about about 5 to 50% of the weight. In the case of ammonium phosphate (poly) system compounds, such as $(\text{NH}_4)_3(\text{P}_n\text{O}_{3n+1})^{(n+2)}$ (n is a natural number), a fire-resistant system additive is about about 3 to 15 % of the weight still more preferably about about 2 to 20% of the weight preferably about about 1 to 25% of the weight. In the case of silica system compounds, such as SiO₂ and glass, a fire-resistant system additive is about about 15 to 30 % of the weight still more preferably about about 10 to 35% of the weight preferably about about 5 to 40% of the weight.

[0028]The hydrolysis inhibitor used by this invention is not limited especially as an additive agent which controls hydrolysis of a biodegradable polymer compound. For example, as said hydrolysis inhibitor, the active hydrogen in a biodegradable polymer compound and the compound which has reactivity are mentioned. It can prevent the amount of active hydrogen in a biodegradable polymer compound decreasing, and active hydrogen hydrolyzing a biodegradable polymer chain catalytically by adding said compound. Here, active hydrogen is hydrogen in the combination (N-H combination and O-H combination) with oxygen, nitrogen, etc. and hydrogen, and this hydrogen has high reactivity compared with hydrogen in combination (C-H combination) of carbon and hydrogen. More specifically, hydrogen in carboxyl group:-COOH [in a biodegradable polymer compound / for example,], hydroxyl group:-OH, amino group:-NH₂, or amide bond:-NHCO- etc. is mentioned.

[0029]As the active hydrogen in said biodegradable polymer compound, and a compound which has reactivity, a carbodiimide compound, an isocyanate compound, and an oxo ZORIN system compound are applicable. Since the melt kneading especially of the carbodiimide compound can be carried out with a biodegradable polymer compound and it can control hydrolysis nature more by a little addition, it is desirable. In a molecule, said carbodiimide compound is a compound which has a carbodiimide group more than a piece, and also contains a poly carbodiimide compound. As a manufacturing method of said carbodiimide compound, As a catalyst, for example For example, O,O-dimethyl- O-(3-methyl-4-nitrophenyl) phosphorothioate, O,O-dimethyl- O-(3-methyl-4-(methylthio) phenyl) phosphorothioate, Organic phosphorus system compounds, such as O,O-diethyl- O-2-isopropyl-6-methylpyrimidine 4-yl phosphorothioate, Or various polymer isocyanates, for example using organic metallic compounds, such as rhodium complexes, a titanium complex, a tungsten complex, and palladium complex Hitoshi, at the temperature of not less than about 70 **. The method of manufacturing according to a decarboxylation polycondensation in a non-solvent or

inert solvents (for example, hexane, benzene, dioxane, chloroform, etc.) can be mentioned.

[0030]As a mono- carbodiimide compound contained in this carbodiimide compound, Dicyclohexylcarbodiimide, a diisopropylcarbodiimide, A dimethylcarbodiimide, a diisobutylcarbodiimide, a dioctylcarbodiimide, A diphenylcarbodiimide, a naphthyl carbodiimide, etc. can be illustrated and dicyclohexylcarbodiimide with easy acquisition and a diisopropylcarbodiimide are especially industrially preferred also in these.

[0031]As an isocyanate compound which are active hydrogen in the above-mentioned biodegradable polymer compound, and a compound which has reactivity, For example, 2, 4-tolylene diisocyanate, 2, 6-tolylene diisocyanate, m-phenylene diisocyanate, p-phenylene diisocyanate, - diphenylmethane diisocyanate, and 4 and 4 '2, 4'-diphenylmethane diisocyanate, 2,2'-diphenylmethane diisocyanate, the 3,3'-dimethyl- 4, 4'-biphenylene diisocyanate, The 3,3'-dimethoxy- 4, 4'-biphenylene di-isocyanate, The 3,3'-dichloro- 4, 4'-biphenylene di-isocyanate, 1,5-naphthalene diisocyanate, 1,5-tetrahydronaphthalene diisocyanate, tetramethylene di-isocyanate, 1,6-hexamethylene diisocyanate, dodeca methylene di-isocyanate, Trimethyl hexamethylene di-isocyanate, 1, 3-cyclohexylene diisocyanate, 1,4-cyclohexylenediisocyanate, xylylene diisocyanate, tetramethyl xylylene diisocyanate, hydrogenation xylylene diisocyanate, lysine diisocyanate, Isophorone diisocyanate, 4,4'-dicyclohexylmethane diisocyanate or the 3,3'-dimethyl- 4, 4'-dicyclohexylmethane diisocyanate, etc. are mentioned.

[0032]The above-mentioned isocyanate compound can be easily manufactured by a publicly known method, and a commercial item can be suitably used for it. As a commercial polyisocyanate compound, aromatic isocyanate adduct objects, such as coronate (the product made from Japanese polyurethane; hydro-diphenylmethane diisocyanate) or milli ONETO (product made from Japanese polyurethane), are applicable. Especially, when manufacturing the constituent concerning this invention by melt kneading, use of a liquefied twist solid, for example, the polyisocyanate compound which blocked the isocyanate group by mask agents (polyhydric aliphatic alcohol, aromatic polyol, etc.), is preferred.

[0033]As an oxazoline system compound which are active hydrogen in the above-mentioned biodegradable polymer compound, and a compound which has reactivity, For example, a 2,2'-o-phenylenescrew (2-oxazoline), a 2,2'-m-phenylenescrew (2-oxazoline), A 2,2'-p-phenylenescrew (2-oxazoline), a 2,2'-p-phenylenescrew (4-methyl-2-oxazoline), A 2,2'-m-phenylenescrew (4-methyl-2-oxazoline), A 2,2'-p-phenylenescrew (4,4'-dimethyl- 2-oxazoline), A 2,2'-m-phenylenescrew (4,4'-dimethyl- 2-oxazoline), 2,2'-ethylene screw (2-oxazoline), 2, and 2'-tetramethylene bis (2-oxazoline), 2,2'-hexa methylenebis (2-oxazoline), 2,2'-octa methylenebis (2-oxazoline), a 2,2'-ethylene screw (4-methyl-2-oxazoline), or a 2,2'-diphenylenescrew (2-oxazoline) is mentioned.

[0034]What is necessary is just to determine the kind and loadings of hydrolysis inhibitor which

are blended with the kind or addition of the hydrolysis inhibitor used by this invention according to the product made into the purpose since a biodegradation rate and by extension, the mechanical strength of the constituent concerning this invention can be adjusted. As for the addition of hydrolysis inhibitor, specifically, it is preferred that it is about 5 or less % of the weight. The above-mentioned compound may be alone used for said hydrolysis inhibitor, and even if two or more sorts are used together and used for it, it is not cared about.

[0035]The manufacturing method in particular of the constituent concerning this invention is not limited, but may use a publicly known method. The method of manufacturing by carrying out melt kneading of the fire-resistant system additive agent and hydrolysis inhibitor which were mentioned above to the organic polymer compound which has biodegradability as said manufacturing method is mentioned as a suitable example. When fusing before fusing the organic polymer compound which has biodegradability as a manufacturing method by said melt kneading or, a fire-resistant system additive agent and hydrolysis inhibitor are added, and it is carried out by mixing. At this time, it may add simultaneously and a fire-resistant system additive agent and hydrolysis inhibitor may be added individually. When adding individually, any may be added first. After adding either a fire-resistant system additive agent or hydrolysis inhibitor after melting and mixing the organic polymer compound which has biodegradability, the obtained constituent is fused again and the method of adding the ingredient of the either remainder of hydrolysis inhibitor or a fire-resistant system additive agent, and mixing is also mentioned.

[0036]Unless the purpose of this invention is spoiled, other publicly known additive agents may contain the constituent concerning this invention. The organic matter etc. which have waxes, colorant, lubricant, a crystallization accelerator besides being a reinforcing member, inorganic matter or an organic filler, an antioxidant, a thermostabilizer, an ultraviolet ray absorbent, etc., and resolvability like starch as said other publicly known additive agents are mentioned. Even if it uses these independently, and it uses combining plurality, they are not cared about.

[0037]As said reinforcing member, quartz like a glass micro bead, carbon fiber, and the chalk (novoculite), for example, a NOBOKYU light, asbestos, feldspar, mica, talc, a silicate like wollastonite, kaolin, etc. are mentioned, for example. As an inorganic filler, for example, alumina besides carbon and a silicon dioxide, Metal oxidation particles, for example, talc, such as silica, magnesia, or a ferrite, Particles, such as silicate, such as mica, kaolin, and zeolite, barium sulfate, calcium carbonate, or fullerene, etc. as an organic filler again for example, An epoxy resin, melamine resin, urea resin, an acrylic resin, phenol resin, polyimide resin, polyamide resin, polyester resin, or Teflon (registered trademark) resin is mentioned. Especially, carbon and a silicon dioxide are preferred. The above-mentioned filler may mix and use one sort or two sorts or more.

[0038]As said antioxidant, a phenol system, an amine system, the Lynn system, a sulfur

system, a hydroquinone system, or a quinoline antioxidant is mentioned, for example. As a phenolic antioxidant, hindered phenols. For example, 2,6-di-*t*-butyl-*p*-cresol, 1,3,5-trimethyl 2,4,6-tris(3,5-di-*t*-butyl-4-hydroxybenzyl) benzene, 2,2'-methylenebis (4-methyl-6-*t*-butylphenol), 4,4'-methylenebis (2,6-di-*t*-butylphenol), 4,4'-butylidenebis (3-methyl-6-*t*-butylphenol), C₂₋₁₀ alkylene diol-screws, such as 1,6-hexane *****-**** [3-(3,5-di-*t*-butyl-4-hydroxyphenyl) propionate] [3-(3,5-di-branching C₃₋₆ alkyl 4-hydroxyphenyl) propionate], For example, triethylene glycol screw [3-(3-*t*-butyl-5-methyl-4-hydroxyphenyl) JI or TORIOKISHI C₂₋₄ alkylene diol-screws [3-(3,5-di-branching C₃₋₆ alkyl 4-hydroxyphenyl) propionate], such as propionate], For example, C₃₋₈ alkanetriol-screws, such as glycerin tris [3-(3,5-di-*t*-butyl-4-hydroxyphenyl) propionate] [3-(3,5-di-branching C₃₋₆ alkyl 4-hydroxyphenyl) propionate], For example, pentaerythritol tetrakis [3-(3,5-di-*t*-butyl-4-hydroxyphenyl) C₄₋₈ alkanetetraol tetrakis, such as propionate] [3-(3,5-di-branching C₃₋₆ alkyl 4-hydroxyphenyl) propionate], For example, n-octadecyl-3-(4',5'-di-*t*-butylphenol) propionate, n-octadecyl-3-(4'-hydroxy-3',5'-di-*t*-butylphenol) propionate, Stearyl 2-(3,5-di-*t*-butyl-4-hydroxyphenyl) propionate, Distearyl 3,5-di-*t*-butyl-4-hydroxybenzyl phosphonate, 2-*t*-butyl-6-(3-*t*-butyl-5-methyl-2-hydroxybenzyl)-4-methylphenyl acrylate, N,N'-hexa methylenebis (3,5-di-*t*-butyl-4-hydroxy-hydronalium SHIMMU amide), A 3,9-screw {2-[3-(3-*t*-butyl-4-hydroxy-5-methylphenyl) propionyloxy]-1,1-dimethylethyl}-2,4,8,10-tetraoxaspiro [5, 5] undecane, 4,4'-thiobis(3-methyl-6-*t*-butylphenol) or 1,1,3-tris(2-methyl-4-hydroxy-5-*t*-butylphenol) butane is mentioned.

[0039]As an amine system antioxidant, phenyl-1-naphthylamine, phenyl-2-naphthylamine, a N,N'-diphenyl-1,4-phenylenediamine, or an N-phenyl-N'-cyclohexyl-1,4-phenylenediamine is mentioned, for example.

[0040]As a Lynn system antioxidant, for example Tri-isodecyl phosphite, Triphenyl phosphite, tris nonylphenyl phosphite, diphenyl isodecyl phosphite, Phenyl di-isodecyl phosphite, 2,2-methylene bis(4,6-di-*t*-butylphenyl)octyl phosphite, 4,4'-butylidenebis (3-methyl-6-*t*-buthylphenyl) ditridecyl phosphite, Tris (2,4-di-*t*-buthylphenyl) phosphite, tris (2-*t*-butyl-4-methylphenyl) phosphite, Tris (2,4-di-*t*-amyl phenyl) phosphite, tris (2-*t*-buthylphenyl) phosphite, Bis(2-*t*-buthylphenyl)phenyl phosphite, tris [2 -(1,1-dimethylpropyl)- phenyl] phosphite, Tris [2,4 -(1,1-dimethylpropyl)- phenyl] phosphite, Phosphite compounds, such as tris (2-cyclohexylphenyl) phosphite and tris (2-*t*-butyl-4-phenylphenyl) phosphite; Triethylphosphine, TORIPURO pill phosphine, tributyl phosphine, tri-cyclohexyl phosphine, Diphenylvinylphosphine, allyl diphenylphosphine, triphenyl phosphine, Methylphenyl *p*-anisyl phosphine, *p*-anisyl diphenylphosphine, *p*-tolyl diphenylphosphine, di-*p*-anisyl phenylphosphine, Di-*p*-tolyl phenylphosphine, tri-*m*-aminophenyl phosphine, Tri-2,4-dimethylphenyl phosphine, the tri- 2 and 4, 6 **TORI methylphenyl phosphine, Phosphine

compounds, such as tri-o-tolyl phosphine, tri-m-tolyl phosphine, tri-p-tolyl phosphine, tri-o-
 **ANI sill phosphine, tri-p-anisyl phosphine, or 1,4-bis(diphenylphospino)butane, etc. are
 mentioned.

[0041]As a hydroquinone system antioxidant, they are mentioned by 2,5-di-t-
 butylhydroquinone etc. and, for example as a quinoline antioxidant, For example, 6-ethoxy-
 2,2,4-trimethyl 1,2-dihydroquinoline etc. are mentioned, and dilauryl thiodipropionate, distearyl
 thiodipropionate, etc. are mentioned as a sulfur system antioxidant, for example. Especially, as
 a desirable antioxidant, a phenolic antioxidant (especially hindered phenols), for example,
 polyol poly [(branching C₃₋₆ alkyl group and hydroxy group substituted phenyl) propionate]
 etc., is mentioned. An antioxidant is independent or may be used two or more sorts.

[0042]As said thermostabilizer, for example Polyamide, the Polly beta-alanine copolymer,
 Polyacrylamide, polyurethane, melamine, cyanoguanidine, nitrogen containing compound [,
 such as basic nitrogen containing compounds, such as a melamineformaldehyde condensation
 product,]; -- organic-carboxylic-acid metal salt (calcium stearate.) metallic oxides (magnesium
 oxide.), such as 12-hydroxycalcium stearate Alkali or alkaline-earth-metals content
 compounds, such as metal hydroxide (magnesium hydroxide, calcium hydroxide, aluminium
 hydroxide, etc.), such as a calcium oxide and an aluminum oxide, and metallic carbonate;
 zeolite; or a hydrotalcite is mentioned. In particular, alkali or an alkaline-earth-metals content
 compound (especially alkaline-earth-metals content compounds, such as a magnesium
 compound and a lime compound), zeolite, or a hydrotalcite is preferred. A thermostabilizer is
 independent or may be used two or more sorts.

[0043]As the above-mentioned ultraviolet ray absorbent, a publicly known benzophenone
 series, a benzotriazol system, a cyanoacrylate system, a salicylate series, or an oxalic acid
 anilide system is mentioned conventionally. For example, a [2-hydroxy-4-(methacryloyl
 oxyethoxy) benzophenone]-methyl methacrylate copolymer, [2-hydroxy-4-(meta-
 KURIROIRUOKI methoxy) benzophenone] - methyl methacrylate copolymer, [2-hydroxy-4-
 (methacryloyloxy octoxy) benzophenone] - methyl methacrylate copolymer, [2-hydroxy-4-
 (methacryloyloxy dodecyloxy) benzophenone] - methyl methacrylate copolymer, [2-hydroxy-4-
 (methacryloyloxy benzyloxy) benzophenone] - methyl methacrylate copolymer, [2,2'-dihydroxy-
 4-(methacryloyl oxyethoxy) benzophenone] - methyl methacrylate copolymer, [2,2'-dihydroxy-
 4-(methacryloyloxy methoxy) benzophenone] - methyl methacrylate copolymer or [2,2'-
 dihydroxy- 4 -(methacryloyloxy octoxybenzophenone)- A methyl methacrylate copolymer etc.
 are mentioned. An ultraviolet ray absorbent is independent or may be used two or more sorts.

[0044]As said lubricant, for example Petroleum system lubricating oil; halogenated
 hydrocarbon, such as a liquid paraffin, Synthetic oil, such as a diester oil, silicone oil, and
 fluoride silicon; various denaturation silicone oil (it and) [epoxy-] Amino modifying, alkyl
 modification, ;, such as polyether denaturation. silicon system lubricant substance [, such as a

copolymer of organic compounds, such as polyoxy alkylene glycol, and silicon,]; -- silicon copolymer; -- various fluorochemical surfactant [, such as a fluoro alkyl compound,]; -- fluorine systems, such as trifluoromethylene chloride low polymer, -- lubricous -- substance; paraffin wax. Waxes, such as polyethylene wax; high-class fatty alcohol, high-class aliphatic series amide, higher-fatty-acid ester, higher fatty acid salt, or molybdenum disulfide is mentioned. Also in these, use of a silicon copolymer (what polymerized silicon by the block or the graft to resin) is preferred especially. As a silicon copolymer, acrylic resin, polystyrene system resin, Poly nitrile system resin, polyamide system resin, polyolefin system resin, epoxy system resin, It is preferred to poly butyral system resin, melamine system resin, VCM/PVC system resin, polyurethane system resin, or polyvinyl ether system resin a block or for what is necessary to be just to carry out graft polymerization, and to use a silicon graft copolymer for silicon. The number of these lubricous substances may be one, and they may be used combining two or more sorts.

[0045]As the above-mentioned waxes, for example Olefin system waxes and paraffin wax, such as polypropylene wax and polyethylene wax, Fischer -- fatty tuna -- a push wax, microcrystalline wax, a montan wax, a fatty-acid-amide system wax, a high-class fatty alcohol system wax, a higher-fatty-acid system wax, a fatty-acid-ester system wax, carnauba wax, a rice wax, etc. are mentioned. These waxes may be used independently and they may be used together combining two or more sorts.

[0046]As said colorant, an inorganic pigment, an organic color, or a color is mentioned. As an inorganic pigment, chromium system paints, cadmium system paints, iron system paints, cobalt system paints, ultramarine, or Prussian blue is mentioned, for example. As a concrete example of an organic color or a color, For example, carbon black;, for example, phthalocyanine pigment; like phthalocyanine copper, for example, Quinacridone magenta, Quinacridone pigment;, for example, Hansa yellow, like the Quinacridone red, The Nigrosine base, azo pigment;, for example, spirit black SB, like Diarylide Yellow, permanent yellow, Permanent Red, and naphthol red, nigrosine dye like the oil black BW, oil blue, or alkali blue is mentioned. Colorant is independent or may be used two or more sorts.

[0047]As said crystallization accelerator, for example p-t-butylsodium benzoate, Sodium montanate, calcium montanate, pulmitic acid sodium, Metallic oxides, such as mineral [, such as organic-acid-salt /, such as calcium stearate, /;, for example calcium carbonate, a calcium silicate, a magnesium silicate calcium sulfate, barium sulfate and talc,];, for example, a zinc oxide, magnesium oxide, and titanium oxide, etc. are mentioned. These crystallization accelerators may be used by one sort, and may be used combining two or more sorts.

[0048]Publicly known processing may be performed to the constituent concerning this invention. For example, in order to control hydrolysis of the biodegradable polymer compound in the constituent concerning this invention, it may be made to irradiate with an activity energy

line to the constituent concerning this invention. As said source of an activity energy line, electromagnetic waves, an electron beam or corpuscular beams, and such combination are mentioned, for example. As electromagnetic waves, ultraviolet rays (UV), X-rays, etc. are mentioned and the line of elementary particles, such as a proton and a neutron, is mentioned as a corpuscular beam. The electron beam irradiation by use of an electron accelerator is preferred also in especially inside.

[0049]It can irradiate with the above-mentioned activity energy line using a publicly known device. For example, a UV irradiation device, an electron accelerator, etc. are mentioned. As an exposure dose and irradiation intensity, in the constituent concerning this invention, if it is a range effectively delayed in hydrolysis of a biodegradable polymer compound, it will not be limited in particular. For example, in the case of an electron beam, about about 100-5000 kV has preferred accelerating voltage, and it is preferred as an exposure dose that they are about 1 or more kGy.

[0050]The constituent concerning this invention is applicable to various uses. For example, molded products, such as a case of electric products, such as radio, a microphone, TV, a keyboard, a portable music reproduction machine, and a personal computer, are obtained, using the constituent concerning this invention. Said molded product can be used not only for the case of an electric product but for other uses, such as a packing material. As a forming process of said molded product, for example, film shaping, extrusion molding, or injection molding is mentioned, and injection molding is preferred also in especially inside. More specifically, extrusion molding can be performed in accordance with a conventional method using publicly known extruding press machines, such as a single screw extruder, a multi-screw extruder, and a tandem extrusion machine. In accordance with a conventional method, an injection molding machine with publicly known inline screw type injection machine, multilayer injection molding machine, two-animal type injection molding machine, etc. can perform injection molding.

[Translation done.]

EXAMPLE

[Example]Although stated in detail below, comparing the example of this invention with a comparative example, it cannot be overemphasized that this invention is not limited to this.

[Examples 1-8, the comparative example 1]

(Adjustment of a sample) As biodegradable resin (A), the reagent was used as it was using Rey Xia (H100J, Mitsui Chemicals, Inc. make) belonging to polylactic acid about various fire-resistant system additive agents (B) and hydrolysis inhibitor (C). The melt kneading method was used for mixing of A, B, and C. As kneading conditions, minimax mix RUDA (made by Oriental energy machine incorporated company) was used as a kneading machine, 170-175 ** and torque were 4-6 kg, holding time was made into less than 3 seconds, and nozzle temperature was added by kneading. After grinding the obtained resin complex, it pressed 300 kg/cm² at 170 **, after molding into a 1.0-mm-thick plate, was cut down to 12.7 mm x 127 mm, and used it as the specimen.

[0052]The presentation list of the samples produced for the example and the comparative example (presentation; weight section) is shown below.

[Table 1]

	生分解性樹脂	難燃系添加剤	加水分解抑制剤
実施例 1	ポリ乳酸 ; 83	$\text{Al}(\text{OH})_3$; 15	ジシクロヘキシル カルボジイミド ; 2
実施例 2	ポリ乳酸 ; 68	$\text{Al}(\text{OH})_3$; 30	ジシクロヘキシル カルボジイミド ; 2
実施例 3	ポリ乳酸 ; 83	$\text{Mg}(\text{OH})_2$; 15	ジシクロヘキシル カルボジイミド ; 2
実施例 4	ポリ乳酸 ; 68	$\text{Mg}(\text{OH})_2$; 30	ジシクロヘキシル カルボジイミド ; 2
実施例 5	ポリ乳酸 ; 88	$(\text{NH}_4)_3(\text{P}_2\text{O}_{3n+1})^{(n+2)}$; 10	ジシクロヘキシル カルボジイミド ; 2
実施例 6	ポリ乳酸 ; 78	$(\text{NH}_4)_3(\text{P}_2\text{O}_{3n+1})^{(n+2)}$; 20	ジシクロヘキシル カルボジイミド ; 2
実施例 7	ポリ乳酸 ; 78	SiO_2 ; 20	ジシクロヘキシル カルボジイミド ; 2
実施例 8	ポリ乳酸 ; 78	低融点ガラス ; 20	ジシクロヘキシル カルボジイミド ; 2
比較例 1	ポリ乳酸 ; 100	—	—

表中、nは整数を表す。

[0053](Burning test) The burning test was done according to UL-94HB using the above-mentioned specimen. The method is described below. Each sample was two places, 25.4 mm and 102 mm, from the end, crossed the sample and drew the line. And the sample was held at the end of the one distant from a 25.4-mm line, the vertical axis was leveled, and the horizontal axis was made to incline 45 degrees. A wire gauze shall be held downward horizontally in a sample, the lower end of a sample and the interval of a wire gauze shall be 9.5 mm, and it was made for the end and the edge of a wire gauze where a sample is not supported to be on the same line. The burner was set in the position which is separated from a sample, and was lit, and it adjusted so that the height of blue flame might be set to 25 mm. Adjust supply of gas, and the airport of a burner first, it is made for the yellow and blue flame of the 25-mm-high point to come out, flame increases the quantity of air after that, and it was made for previous yellow to disappear. Again, the height of flame was measured and was united with 25 mm.

Flame was hit to the lower end of the end which does not hold a sample. Then, the medial axis of a burner tube shall receive horizontally, shall be made to incline about 45 degrees, and shall be in the same vertical plane as the margo inferior of the vertical axis of a sample. By Fukashi who is about 6 mm, the front end of the sample guessed flame for 30 seconds, without moving the position of a burner, and kept away flame from the sample. We decided to stop ****, when the sign line whose flame is 25.4 mm when burning to the sign line whose sample is 25.4 mm before flame hits for 30 seconds was reached. When a sample continues burning even after keeping away flame, time for a sample to burn from the end which is not held to the 102-mm sign line which is not held from a 25.4-mm sign line was timed, and the rate of combustion was computed.

[0054]Below, the result of the burning test to the specimen obtained by the example and the comparative example is shown.

[Table 2]

	燃焼速度
実施例 1	102mmの標線手前で消火
実施例 2	102mmの標線手前で消火
実施例 3	102mmの標線手前で消火
実施例 4	102mmの標線手前で消火
実施例 5	102mmの標線手前で消火
実施例 6	102mmの標線手前で消火
実施例 7	5 7 . 4 (mm/分)
実施例 8	102mmの標線手前で消火
比較例 1	8 1 . 2 (mm/分)
参考	7 6 . 2 (mm/分)

なお、表中参考とは、UL-94HBの規格値を示す。

[0055]From the upper table, flameproofing of the constituent in which the sample of Examples 1-8 has biodegradability is realized compared with the comparative example 1. And the rate of combustion of the sample of Examples 1-8 fully fulfills a UL-94HB standard.

[0056][Examples 9-11, the comparative example 2] The presentation list of the samples produced for the example and the comparative example (presentation; weight section) is shown below. Adjustment of the sample was performed by the same method as the above.

[0057]

[Table 3]

	生分解性樹脂	難燃系添加剤	加水分解制御剤
実施例 9	ポリ乳酸 ; 93	タルク ; 5	ジシクロヘキシル カルボジイミド ; 2
実施例 10	ポリ乳酸 ; 83	タルク ; 15	ジシクロヘキシル カルボジイミド ; 2
実施例 11	ポリ乳酸 ; 68	タルク ; 30	ジシクロヘキシル カルボジイミド ; 2
比較例 2	ポリ乳酸 ; 98	—	ジシクロヘキシル カルボジイミド ; 2

[0058](A burning test - the level) The horizontal-firing examination was done according to UL-94HB using the above-mentioned specimen. The method is described below. Each sample was two places, 25.4 mm and 102 mm, from the end, crossed the sample and drew the line. And the sample was held at the end of the one distant from a 25.4-mm line, the vertical axis was leveled, and the horizontal axis was made to incline 45 degrees. A wire gauze shall be held downward horizontally in a sample, the lower end of a sample and the interval of a wire gauze shall be 9.5 mm, and it was made for the end and the edge of a wire gauze where a sample is not supported to be on the same line. The burner was set in the position which is separated from a sample, and was lit, and it adjusted so that the height of blue flame might be set to 25 mm. Adjust supply of gas, and the airport of a burner first, it is made for the yellow and blue flame of the 25-mm-high point to come out, flame increases the quantity of air after that, and it was made for previous yellow to disappear. Again, the height of flame was measured and was united with 25 mm. Flame was hit to the lower end of the end which does not hold a sample. Then, the medial axis of a burner tube shall receive horizontally, shall be made to incline about 45 degrees, and shall be in the same vertical plane as the margo inferior of the vertical axis of a sample. By Fukushima who is about 6 mm, the front end of the sample guessed flame for 30 seconds, without moving the position of a burner, and kept away flame from the sample. We decided to stop ****, when the sign line whose flame is 25.4 mm when burning to the sign line whose sample is 25.4 mm before flame hits for 30 seconds was reached. When a sample continues burning even after keeping away flame, time for a sample to burn from the end which is not held to the 102-mm sign line which is not held from a 25.4-mm sign line was timed, and the rate of combustion was computed. And 94HB authorization material, i.e., the material recognized as 94HB, must suit a combustion stop, and (b) 76.2-mm two conditions of the following by /in 102 mm (a) this side.

[0059](A burning test - a perpendicular) The vertical flame test was done according to UL-94V0 - 2 using the above-mentioned specimen. The method is described below. each sample -- the horizontal bed of the upper bed to 6.4 mm absorbent cotton for surgery which made the

vertical axis vertical by the way, and was held by the clamp of the ring stand, and the tip of the burner dried downward under 9.5 mm from the lower end of the sample at 305 mm -- ** -- it is made like. In order to make a horizontal bed, by the thumb and an index finger, the wafer like about 12.7 mmX(s)25.4mm is torn, and it extends thinly with a finger from the lump of cotton, and is made for natural thickness to be set to 6.4 mm by 50.8-mm square. A burner is set in the position which is separated from a sample, and is lit, and it adjusts so that 19-mm-high blue flame may come out. Flame adjusts the amount of supply of gas, and the airport of a burner, first, it is made for the yellow and blue flame of the 19-mm-high point to come out, and it carries out it.

Then, the quantity of ** is adjusted and it is made for previous yellow flame to be lost.

The height of flame is measured once again and it adjusts if needed.

[0060]Examination flame is hit to the center of the lower end of a test sample, and it continues as it is for 10 seconds. And flame is detached at least 152 mm and a sample records time to take out flame and burn. Shortly after the flame of a sample disappears, examination flame is again applied to the lower end of a sample. And in 10 seconds, flame is detached again and the burning time of owner flame and flashless is recorded. When it is difficult to identify the owner flame and flashless by viewing, the cotton for surgery is contacted in the interrogative part. It will be owner flame if cotton lights. When fusion or an owner flame substance trickles from a sample during each approaching flame, it may avoid that make a burner incline to the angle of 45 degrees during the approaching flame, keep away a few from either of the 12.7-mm fields of a sample very much further again, and material trickles into a burner tube. When fusion or an owner flame substance trickles from a sample or it continues burning during an examination, a burner must be made into a stock and, as for under an approaching flame, a 9.5-mm interval must be held between the lower end of a sample, and the tip of a burner tube. Dropping of all the fusion materials shall be disregarded and an approaching flame must be carried out in the center of a sample.

[0061]And 94V-2 authorization material, i.e., the material recognized as 94V-2, must suit the following conditions.

- (a) After applying flame each time, all trial production should take out flame 30 seconds or more, and should not burn.
- (b) Perform a total of ten approaching flames in the sample of five each class, and the sum total of time to take out flame and burn should not exceed 250 seconds.
- (c) Combustion of owner flame or flashless should not attain all the sample to a support clamp.
- (d) It is allowed to light the dry absorbent cotton for surgery where a sample trickles a substance and which has it under 305 mm.
- (e) Not all the sample should continue combustion of flashless 60 seconds or more, after

keeping away flame to the second time.

[0062]Below, the result of the above-mentioned burning test to the specimen obtained by Examples 9-11 and the comparative example 2 is shown.

[Table 4]

	水平燃焼試験	垂直燃焼試験
実施例 9	102mm の標線手前で消火	UL94-V2 ; ○
実施例 10	102mm の標線手前で消火	UL94-V2 ; ○
実施例 11	102mm の標線手前で消火	UL94-V2 ; ○
比較例 2	93.5mm/分	UL94-V2 ; ×

It is shown among front that "UL94-V2;O" is 94V-2 authorization material, and it is shown that "UL94-V2;x" is not 94V-2 authorization material.

[0063]From the upper table, flameproofing of the constituent in which the sample of Examples 9-11 has biodegradability is realized compared with the comparative example 2. And the rate of combustion of the sample of Examples 9-11 fully fulfills a UL-94HB standard. And UL-94V2 is fully filled.

[0064][Examples 12-19, the comparative example 3] The presentation list of the samples produced for the example and the comparative example (presentation; weight section) is shown below. Adjustment of the sample was performed by the same method as the above.

[Table 5]

	生分解性樹脂	難燃系添加剤	加水分解制御剤
実施例 12	ポリ乳酸 ; 93	水酸化アルミニウム ; 5	ジシクロヘキシル カルボジイミド; 2
実施例 13	ポリ乳酸 ; 88	水酸化アルミニウム ; 10	ジシクロヘキシル カルボジイミド; 2
実施例 14	ポリ乳酸 ; 78	水酸化アルミニウム ; 20	ジシクロヘキシル カルボジイミド; 2
実施例 15	ポリ乳酸 ; 68	水酸化アルミニウム ; 30	ジシクロヘキシル カルボジイミド; 2
実施例 16	ポリ乳酸 ; 48	水酸化アルミニウム ; 50	ジシクロヘキシル カルボジイミド; 2
実施例 17	ポリ乳酸 ; 93	水酸化マグネシウム ; 5	ジシクロヘキシル カルボジイミド; 2
実施例 18	ポリ乳酸 ; 73	水酸化マグネシウム ; 25	ジシクロヘキシル カルボジイミド; 2
実施例 19	ポリ乳酸 ; 48	水酸化マグネシウム ; 50	ジシクロヘキシル カルボジイミド; 2
比較例 3	ポリ乳酸 ; 98	—	ジシクロヘキシル カルボジイミド; 2

[0065]The horizontal-firing examination and the vertical flame test were done on below by the completely same method as the above to the specimen obtained by Examples 12-19 and the comparative example 3. The result is shown in the following table.

[0066]

[Table 6]

	水平燃焼試験	垂直燃焼試験
実施例 12	102mm の標線手前で消火	UL94-V2 ; ○
実施例 13	102mm の標線手前で消火	UL94-V2 ; ○
実施例 14	102mm の標線手前で消火	UL94-V2 ; ○
実施例 15	102mm の標線手前で消火	UL94-V2 ; ○
実施例 16	102mm の標線手前で消火	UL94-V2 ; ○
実施例 17	102mm の標線手前で消火	UL94-V2 ; ○
実施例 18	102mm の標線手前で消火	UL94-V2 ; ○
実施例 19	102mm の標線手前で消火	UL94-V2 ; ○
比較例 3	93.5mm/分	UL94-V2 ; ×

It is shown among front that "UL94-V2;O" is 94V-2 authorization material, and it is shown that "UL94-V2;x" is not 94V-2 authorization material.

[0067]From the upper table, flameproofing of the constituent in which the sample of Examples 12-19 has biodegradability is realized compared with the comparative example 3. And the rate of combustion of the sample of Examples 12-19 fully fulfills a UL-94HB standard. And UL-94V2 is fully filled.

[Translation done.]